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1896, May 18 - H. U. publ. office
1897, May 8. Bowditch fund.

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OFFICERS.

IV. The officers shall be a President, a First, and a Second Vice-President, a Secretary, and a Treasurer.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The President, or in his absence one of the Vice-Presidents, or in their absence a chairman *pro tempore*, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other committees of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If, from the annual report of the Treasurer, there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

REPORTS AND PAPERS.

XII. All committees, and all members preparing scientific reports of papers to be laid before the Association at its annual meetings, must give, in writing, the title of such reports or papers, the time to be occupied in reading them, and an abstract of their contents, to the Executive Committee, at least one week preceding the date of such meeting, to secure their announcement in the order of business.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called, at any time or place, by concurrence of two thirds of the Executive Committee. There shall be no election of officers, or change of By-Laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the Constitution of the Association shall be made except at an annual meeting, or unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two thirds of the members present.

report the same to the Association incorporated with their annual reports, or refer them to the Executive Committee for consideration.

8. No paper shall hereafter be considered, of which a condensed abstract shall not have been placed in the hands of the secretary at least twenty days before the date of the annual meeting.

9. Chairmen of committees, in making reports, shall be absolutely limited to thirty minutes, reading of papers to twenty minutes, and participants in discussion to five minutes.

10. Papers presented to the Association shall be confined to strictly sanitary, climatologic, and preventive questions, all clinical, pathological, therapeutic, or other strictly medical statements being excluded; nor shall any paper tending to the advertisement of special or local interests or establishments be accepted.

11. The Secretary shall have no discretion in the matter of the enforcement of the regulations of the Executive Committee as to the acceptance of papers.

PUBLICATION COMMITTEE.

12. The Committee on Publication, charged with the duties of selecting and printing the papers and transactions of the Association, shall consist of three active members of the Association, and of whom one shall be the Secretary, appointed by the Executive Committee during the session of the Association, and selected with reference to their facilities of meeting.

13. All papers read by title, and others not definitely passed upon by the Executive Committee, shall be referred to the Publication Committee for critical examination; and said committee is authorized to reject such papers as in its judgment are not worthy of publication, and to omit such others as cannot be included within the limits of the annual volume.

14. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

15. All applications for membership must be made upon the application blank of the Association. The Secretary is authorized, upon receiving an application for membership in the interval between the annual meetings, accompanied by the fee of five dollars, to furnish the applicant with the current volume of the transactions, and is directed to place the name of the applicant so supplied, when properly endorsed, upon the list of candidates to be acted upon at the next annual meeting. The Secretary shall notify each applicant of the action taken, and shall transfer without delay all money thus received to the Treasurer.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

OFFICERS, 1895–1896.

President, ...	Dr. Eduardo Licéaga, *Mexico, Mex.*
First Vice-President, .	Lieut. Col. Alfred A. Woodhull, Medical Dept., U. S. Army, *Denver, Col.*
Second Vice-President,	Dr. Henry Sewall, *Denver, Col.*
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Treasurer, ...	Dr. Henry D. Holton, *Brattleboro', Vermont.*

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Medical-Director Albert L. Gihon	*U. S. Navy.*
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Dr. Henry B. Baker	*Lansing, Mich.*
Dr. Frederick Montizambert	*Quebec, Canada.*
Dr. Felix Formento	*New Orleans, La.*
Dr. Samuel H. Durgin	*Boston, Mass.*
Dr. E. P. Lachapelle	*Montreal, P. Q.*
Dr. William Bailey	*Louisville, Ky.*

(The ex-Presidents, *ex-officio* members Executive Committee.)

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(Elective.)

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Dr. E. P. DeVaux	*Valley City, N. D.*
Dr. J. C. Shrader	*Iowa City, Iowa.*

Dr. R. S. Goodwin . . . . *Thomaston, Conn.*
Dr. James F. McShane . . . . *Baltimore, Md.*

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Georgia	Dr. William F. Brunner, *Savannah.*
Illinois	Dr. L. H. Montgomery, *Chicago.*
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Iowa	Dr. A. W. Cantwell, *Davenport.*
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Massachusetts	Dr. S. H. Durgin, *Boston.*
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U. S. M. H. Service	Surgeon P. H. Bailhache, *Stapleton, Staten Island, N. Y.*
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Province of Quebec	Dr. E. P. Lachapelle, *Montreal.*

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Dr. Charles N. Hewitt	Red Wing, Minn.

(With authority to select associates.)

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Dr. Domingo Orvañanos	Mexico, Mex.
Prof. S. H. Woodbridge	Boston, Mass.
Dr. E. R. Lewis	Kansas City, Mo.

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Dr. Gregorio Mendizabal	Orizaba, Vera Cruz, Mex.
Dr. Manual Carmona y Valle	Mexico, Mex.
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Mr. Alfred V. Wood	Brunswick, Ga.

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Dr. Angel Contreras	Puebla, Puebla, Mex.
Dr. N. S. Davis	Chicago, Ill.

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Dr. Elzéar Pelletier	Montreal, P. Q.
Dr. Salvador Garciadiego	Guadalajara, Jalisco, Mex.
Dr. Charles R. Walker	Concord, N. H.

ON TRANSPORTATION OF DISEASED TISSUES BY MAIL.

Dr. Henry Mitchell	Trenton, N. J.
Dr. E. P. Lachapelle	Montreal, P. Q.
Dr. Domingo Orvañanos	Mexico, Mex.

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Dr. C. O. Probst	Columbus, Ohio.
Rudolph Hering, C. E.	New York City.

CHAIRMAN LOCAL COMMITTEE OF ARRANGEMENTS.

Dr. Ernest Wende	Buffalo, N. Y.

ANNUAL REPORT OF THE TREASURER OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, FOR THE YEAR ENDING SEPT. 24, 1894.

HENRY D. HOLTON,
IN ACCOUNT WITH
THE AMERICAN PUBLIC HEALTH ASSOCIATION.

RECEIPTS.

1893.		
Sept. 26.	Cash on hand	$2,154.37
	Cash from sale of Transactions	74.00
	Cash from dues of members	1,405.25
		$3,633.62

DISBURSEMENTS.

Oct. 30.	Henry D. Holton, treasurer, expenses of president, secretary, and treasurer, as per bill, order No. 10	$176.50
Oct. 30.	Henry D. Holton, treasurer, expenses and amount voted treasurer, order No. 11	148.70
Oct. 30.	S. H. Durgin, president, expenses as per bill, order No. 12,	55.00
Oct. 30.	Irving A. Watson, secretary, expenses as per bill, order No. 13	52.00
Nov. 21.	Silsby & Son, stationery, as per bill, order No. 14	103.60
Nov. 21.	William Whitford, reporting Chicago meeting, as per bill, order No. 15	96.40
Dec. 12.	Morton, Phillips & Co., envelopes as per bill, order No. 16	3.00
Dec. 29.	Vermont National Bank, desk for secretary as per bill, order No. 17	57.60
1894.		
May 22.	American Express Co., distributing Transactions of Mexico meeting as per bill, order No. 18	86.80
Aug. 10.	Republican Press Association, for printing as per bill, order No. 19	1,354.89
Sept. 24.	Henry D. Holton, treasurer, money paid out as per bill, order No. 20	131.39
Sept. 24.	*Cash on hand	1,367.74
		$3,633,62

HENRY D. HOLTON, *Treasurer*.

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* This includes Index fund, $793.98.

SANITARY AUTHORITIES AND ASSOCIATIONS

OF THE

UNITED STATES OF AMERICA, THE DOMINION OF CANADA, AND THE REPUBLIC OF MEXICO.

1896.

AMERICAN PUBLIC HEALTH ASSOCIATION.

President, Dr. Henry B. Horlbeck, Charleston, S. C.
First Vice-President, Dr. Ernest Wende, Buffalo, N. Y.
Second Vice-President, Dr. Peter H. Bryce, Toronto, Canada.
Secretary, Dr. Irving A. Watson, Concord, N. H.
Treasurer, Dr. Henry D. Holton, Brattleboro', Vermont.

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President, Dr. C. A. Ruggles, Stockton, Cal.
Vice-President, Dr. Benjamin Lee, Philadelphia, Pa.
Secretary and Treasurer, Dr. C. O. Probst, Columbus, Ohio.

UNITED STATES MARINE HOSPITAL SERVICE.

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During the legislative session of 1895, a bill was introduced creating a state board of health, which was killed in the committee.

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Organized May, 1894; holds its meetings annually in May.

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In 1859, when I was a youth, as you may well know, I was visiting the city of St. Joseph, Mo., and I there beheld such a sight as I have not witnessed since. I saw the immense trains returning from Pike's Peak and Colorado, and perhaps from Denver, and such a dejected, disappointed body of men I had never seen. You remember possibly the famous motto emblazoned on the covers of many of the wagons, "To Pike's Peak or Bust."

I thought at the time that they had failed to reach their destination but had little doubt about the alternative. From the immense number of them I thought they had all returned, but I am now convinced that many did not, and have found more than they looked for.

I must desist from this line of thought for the association does not permit its influence to be used for the booming of any local interests.

I beg leave to express the thanks of the association to the people of Denver for your interest in our work as evidenced by your kind invitation to meet in your city, by your generous and unbounded hospitality, and by your presence in such numbers this evening. I extend to you a cordial invitation to be present at these sessions and will promise that you will find much to interest any one who is enlisted in any way for the betterment of his kind.

You are already well informed as to the advantages that accrue from well-directed sanitary effort. You have had a valuable object lesson in a fifty per cent. reduction in the death rate in your city in the last five years. Our association is largely educational and almost invariably an impetus is given to sanitary work in the cities and states in which we meet. We stir up your minds by way of remembrance if nothing more.

Members of the association: We are met under the most favorable auspices. Everything conduces towards a pleasant and profitable meeting.

No great or alarming epidemics have prevailed within our borders.

Mutterings of the dread march of cholera come to our ears from the Orient but by way of the Golden Gate. It is to be hoped that the efficient forces of California, supplemented, if need be, by the general government, will be able to successfully resist any occupation of our territory.

In this connection I would urge the association to redouble its diligence in its effort to have established a department of health for the government of the United States.

It seems incomprehensible that those concerned with legislation are about the only ones who cannot be brought to a realization of this the highest demand of statesmanship, namely, a proper care and regard for the public health. Gladstone styles it the highest office of statesmanship. A well-equipped health department in the government of the United States would be a great power for good. It is a necessity for the most successful management of maritime quarantine. Under the advanced ideas of sanitation, quarantine is no longer a detention of forty days.

has been made. I hope the Association will see fit to foster this coöperative work until success complete shall crown the effort of your committee.

I beg leave to call the attention of the Association to an experience as your chief officer. In my correspondence with the representative men of the Association, I find many of the college men were unable to avail themselves of the privilege of attendance at this meeting on account of their professional duties. These men can attend better in the month of September, or later, after the session is well under way. Some attention should be given to this subject, for we lose the aid of some of our best men.

The great question of the day for sanitarians, it seems to me, is that of immunity. The possibilities in this direction may exceed our wildest imaginings. What seemed but a dream to us only a few years ago may now be accomplished. We are in the midst of a great revolution in the management of disease. We are day by day arriving at more definite knowledge concerning the essential nature of disease processes, and are cultivating more closely the field of causation. This is, perhaps, the most important department of medicine. Management of disease must become more rational and more efficient as we advance in the knowledge. Unfortunately nothing in recent discovery rivals vaccination. Here we have absolute demonstration so oft repeated and so clear that those only can doubt who *will* not to believe.

It will be fit for this Association to perfect its plans for some memorial celebration of the discovery of the immortal Jenner. I know of no better way than that a suitable committee should prepare a report for our next session which shall ably set forth the perfection of the immunity from small-pox by vaccination, and under proper restrictions its absolute safety. No single discovery of any age has saved so many lives nor mitigated so much of human suffering as has this of Jenner. We must acknowledge that many of us have become too neglectful of its advantages, and now many communities have a large number of people who are not immune. But little attention is paid to vaccination until a case of small-pox occurs, and it is then found that the danger is much greater than it ought to be because so many persons have not been vaccinated. Small-pox ought to be regarded as a disgrace to the city, town, or country in which it occurs. Many reasons, however, may prevent beside mere negligence. It may be that compulsory vaccination laws have in some instances stimulated the resistance of the ignorant, who imagine, or have been taught by designing ones, that it is better to suffer the ills of small-pox than fly to those they know not of.

Let this report set forth in proper manner the blessings of vaccination, and at the same time demonstrate its safety, and it will be a fitting memorial to Jenner and bring safety to thousands of people, who will be vaccinated because of the public attention to the subject by this means. Small-pox ought to be blotted off the face of the earth, and could be in less than a generation.

the same circumstances. These and many other questions are yet subjective, but I have confidence that all obstacles will be overcome and that finally it will be well with serum immunity. It is also urged against it that the exemption is for a limited period of time. It should be remembered that an attack of some of these diseases does not exempt for any but a limited period. We cannot reasonably expect the immunity from serum to last longer than it would from an attack of the disease. Elsewhere I had occasion to say that we do not hesitate to secure for our patients the prophylactic influence of the salts of quinia because, forsooth, you cannot secure exemption from malaria for all time by the administration of these salts for one season.

Ladies and gentlemen, I have satisfaction in saying that I have read to you the shortest, if not the best, presidential address ever delivered to the American Public Health Association.

ADDRESS.

By Hon. T. S. McMURRAY, Mayor of Denver.

Mr. President and Members of the American Public Health Association, Ladies and Gentlemen:

The pleasant duty devolves upon me to welcome you to the city of Denver, whose chief executive I have the honor to be. You are welcomed each one individually, as we welcome all who come to see us. You are also welcome in your collective capacity, because that which brings you here is something which demands the attention of all thoughtful men and women. The question of the health of a community or communities is one which in importance overshadows everything else that may come before us. Away back in the early days of the history of our race, the first born of man asked a question which has reverberated down the ages from that time until now, "Am I my brother's keeper?" That question is answered, and we are asking ourselves that question and are being continually called upon to answer that we are our brother's keeper in so far as it is within our power to guard the life and health of those around us. It devolves upon us to exercise all the powers that may be in us to accomplish that desirable thing. And so as members of this health association, devoted to the science of sanitation, you have met to consider all those questions which go to guard the health of any community. You are met together to talk over these questions, and you have one of the most important themes that can come before any body of men, namely, the health of the people.

As executive officers of a city, we are interested in the carrying on of philanthropic work. Your highest aims are to make our cities healthful, to lower the death rate, and above all things to alleviate human suffering. I need not tell you that human life stands preëminent, and so, if in the course of your discussions or deliberations you are able to bring into operation something that will save one human life in each community from which you come, your meeting will not have been in vain. Whatever may be the different lines on which you operate, whether it be for the prevention of the contagious diseases that sweep over our land in epidemic form and carry away thousands in their march, or whether it be the ordinary course of life, you are doing that which is best for the welfare of those who are around you. We trust that your short sojourn here will be pleasant and profitable, and I am sure that your deliberations will be very interesting to the public. As you discuss the great questions that come before you, we ask you to bear in mind the importance of a welcome to this city; we trust that you will have a pleasant time while you are

REMARKS.

BY REV. CHANCELLOR McDOWELL, OF DENVER.

GENTLEMEN:—I was kindly asked by my friend, Dr. Henry Sewall, chairman of the local committee of arrangements, to add a few words to what has already been said by the executive officers of the state and city. Usually, I do whatever the doctor says. I am afraid that this public health business has caused a great many of us to feel uncomfortable. Indeed, I am afraid to start out on the street for fear I will meet a microbe with a club, and it would be more agreeable if we did not have to dodge microbes all the time. We are told that there are microbes in what we eat, drink, and wear. They are present everywhere. It is no longer safe to go into a house or go out of one. It is no longer safe to ride in a street car or to walk, just because physicians have told us that in every community these microbes are let loose, and there seem to be but two things to do. One is to give the public health the right of way in the interest of public safety. If there is anything lacking in the way of legal restraint in this matter of health, then the executives of our cities should see that such a want is immediately supplied.

I was brought up under Thomas Jefferson's principles, and I am as firm a believer in the principles of personal liberty as any man needs be; but there comes a time in this matter of public health when personal liberty needs not only a small amount of personal restraint in the interest of the public health, but of the welfare of the public. The familiar legend should be put in our street cars, "Do not spit on the floor, especially if you are a consumptive." Here is a man by my side, for instance, who tells the health officer that he will spit where he pleases. I do not suggest violent measures, but there are two things open, and one is the governor should have power to call out the militia in reference to all such men, or they should have the hose turned on them by the fire department. I mean to say just this, that there should be some means devised where personal liberty shall not conflict for the sake of the larger liberty or freedom which we all desire—that freedom from danger, disease, and death which our health officers ought to be empowered to secure for us.

If I had my way I would take this entire matter of the public health out of politics, for fear the health business itself becomes infected with germs. The business of caring for the public health in any community devolves upon the health officers. Talk about disease being contagious: Some-one has said, "Why did not God Almighty make health contagious?" With all deference to this remark, I will say that God Almighty did make health contagious. Nobody can clean up his front yard without compelling other people to do so. My neighbor cleaned out his gutter last

REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOODS.—NECESSITY FOR CO-OPERATION IN THE INSPECTION OF MEATS.[1]

BY D. E. SALMON, D. V. M., CHAIRMAN OF THE COMMITTEE.

The more we investigate the diseases of animals; the more we observe the condition in which meat producing animals arrive at our great stock-yards; and the more we learn of the principles upon which abattoirs are operated, the more positive becomes our conviction of the necessity for a rigid system of meat inspection.

From the point of view of the American consumer, the inspection of meat is not yet in a satisfactory condition. We have a federal meat inspection and a municipal meat inspection, each independent of the other, each conducted on different principles, and where the two accidentally come in contact there has oftener been friction and antagonism than friendliness and coöperation. Every member of this Association must feel that such a condition of affairs is radically wrong, and that it should be at once done away with, and a cordial, active, and efficient plan of coöperation established.

The American Public Health Association embraces within its membership nearly, if not quite, all the officials whose assistance is required to bring about this great reform. Municipal inspection can never properly protect consumers until it has the assistance which can be rendered by the federal government through its men, its money, and its jurisdiction over inter-state commerce. Federal inspection is equally lacking, because it cannot touch meat unless it is found in the channels of inter-state commerce, and even then, under the statutes now in force, the condemned meat may be sold for local consumption. As sanitarians we need to combine our forces, and so adjust them that the weak parts of one may be corrected by proper adjustment with the strong parts of the other.

Your committee does not hesitate to invite your attention to this subject, as the most serious and important of all the questions which have come before it since its last report was made. We appreciate that it is a delicate matter to handle—that to go into details unduly would suggest a charge of sensationalism, and might unnecessarily injure legitimate trade, while in avoiding these we may fail to make as strong an impression as is desirable. It is hoped that a conservative presentation of the subject will secure the sympathy and interest of the members of this great organization.

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[1] Presented at the Denver Meeting.

The act of congress under which the federal inspection is conducted, provides for an inspection prior to slaughter of all cattle, sheep, and hogs the carcasses or products of which are to be transported and sold for human consumption in any other state or territory, or the District of Columbia. It is made unlawful for any person to transport from one state into another, either the carcasses or the food products of any of the animals named which have been examined and declared unsound or diseased.

There is nothing in this law, however, which prevents the owner from selling the condemned animals to be slaughtered for local consumption, or which interferes with their shipment to any other part of the country.

It must be evident that an animal which is not in proper condition to be slaughtered to produce meat for the inter-state trade is not in proper condition to be slaughtered for local consumption; nor is the condition of the animal likely to be improved by shipment to some other town or city either in the same or in another state. With proper coöperation, an animal condemned by the federal inspectors could not be slaughtered in the same city and the meat sold for local consumption, and if shipped to some other place, the health authorities, promptly notified, would be ready to take charge of it on its arrival.

The federal inspection does not make the task of the local health boards lighter than heretofore; on the contrary, it is made more arduous, and this fact should be clearly understood. The tendency is to slaughter condemned animals for local consumption, or to ship those which are likely to be condemned, to cities where there has been no federal inspection established. This withdraws animals, unfit for food, from slaughter for the inter-state trade, and puts them upon the local market. To protect this local market we must rely entirely upon the local boards.

It is possible for the same thing to occur with condemned meat as with condemned animals. The federal law allows this meat, no matter how dangerous it may be, to be sold locally for human food. The regulations of the Department of Agriculture have been drawn, however, with the idea of restricting as much as possible such sale of condemned meat. These regulations provide that in those cases where the owners of condemned carcasses do not consent to tank them, that such carcasses shall be branded with the word condemned, that a record shall be kept of their kind and weight, that they shall be removed from the packing house, and that the firm or corporation owning them, shall make a sworn statement monthly in detail, showing to whom sold, whether for consumption, for food or otherwise, with what knowledge if any by the purchasers of their condemnation, and whether before their sale their condition had been altered by cooking or in any other way. This was considered a necessary regulation to prevent the shipment of condemned meats to other states, but its effect will undoubtedly be to largely prevent the sale of such meats for human food by responsible firms. One firm, only, has taken advantage of this privilege of selling condemned meat locally and has thus disposed of a number of carcasses rejected on account of pregnancy.

Under the federal inspection all animals and meats affected as follows are condemned: 1. Hog cholera; 2. Swine plague; 3. Anthrax; 4. Rabies; 5. Malignant epizootic catarrh; 6. Pyaemia and septicaemia; 7. Mange or scab in advanced stages; 8. Advanced stages of actinomycosis, or lumpy-jaw; 9. Inflammation of the lungs, intestines, or the peritoneum; 10. Texas fever; 11. Extensive or generalized tuberculosis; 12. Animals in an advanced state of pregnancy, or which have recently given birth to young; 13. Any disease or injury causing elevation of temperature or affecting the system of the animal to a degree which would make the flesh unfit for food.

For the above conditions the entire carcass is condemned. In addition to this any organ or part of a carcass which is badly bruised or affected by tuberculosis, actinomycosis, cancer, abscess, suppurating sore, or tape worm cysts must be condemned.

Considering that the inspection has only recently been inaugurated, this list of causes for condemnation is as comprehensive as should be expected. There are some, however, who criticise the inspection for being too rigid, and others who are equally positive that it is not rigid enough. Your committee is of the opinion that, in the present condition of the inspection service, it is wise to avoid extremes, and that it is more important to secure the rapid and unimpeded extension of this inspection to all parts of the country, where animals are slaughtered for the interstate trade, than it is to make the inspection more severe and onerous in places where it is now in effect.

The difficulty in the way of a uniform system and coöperation between the federal and local authorities is not that the regulations of the former are too lax, but is found in the indisposition of the latter to enforce or assist in enforcing a systematic inspection. There may be a few cities to which this statement does not apply, but they are very few. This lack of systematic local inspection is no doubt for the most part due to lack of funds. In cities where the federal inspection is established great benefits could be secured from this without increased expenditures by making it a punishable offense to sell the condemned meat, or to slaughter the condemned animals, and sell their products for human food. A few convictions would break up this practice.

There should, however, be an increased force of meat inspectors in most cities. Small slaughter houses which do a strictly local business and which are in the hands of unprincipled parties are too numerous, and all such should have the strictest supervision. To reach these it is necessary that there should be inspection at all abattoirs. When animals are condemned as unfit to be slaughtered for the inter-state trade, there should be no avenue left open by which they may reach the consumer; nor should the shipper of stock be able to avoid inspection by shipping to one place rather than another.

Too often the local inspection takes cognizance of but a few conditions. Lumpy-jaw cattle and badly injured animals are severely dealt with, but how many hogs are condemned for cholera? how many sheep for scab? how many cattle and hogs for tuberculosis? how many animals for pregnancy or parturition? how many for metritis, peritonitis, septicaemia, pyaemia, and other conditions equally loathsome and dangerous to the consumer? There should be severe penalties imposed upon any who are reckless enough to sell to innocent purchasers, the meat of animals in such conditions, and there should be in addition the safe-guard of a rigid inspection.

Your committee does not consider it practicable, at least for the present, to undertake to protect consumers from trichinous pork by microscopic inspection. The federal trichinae inspection has been a commercial inspection, made with the purpose of placing American pork in certain markets which require such an inspection, but not with any idea of protecting American consumers. To microscopically examine every carcass in this country would be a tremendous undertaking, and would require an enormous expenditure. There are about thirty million hogs slaughtered in the United States annually. If these could be inspected for six cents each the total cost would be $1,800,000. The loss to the trade from condemned carcasses would be much greater than this. Even then, trichinosis in people would not be prevented and it is not certain that the number of cases would be reduced. It is impossible to find all the trichinous carcasses by any method yet devised. This is not accomplished in Germany where microscopic inspection has been established for a long time, and where a most searching examination is made. The effect of a general microscopic inspection would be to establish a feeling of security, leading to greater consumption of raw and underdone pork, and the few carcasses in which the trichinae escaped detection would cause more infections than the same number do now. Is it not much better to teach our citizens the necessity of thoroughly cooking pork, and thus protecting themselves more efficiently than they can be protected by any system of inspection?

As horses have become of less value than heretofore, establishments for the slaughter of these animals are beginning to operate in different parts of the country. It is not our purpose to discuss the relative wholesomeness of bovine and equine flesh as articles of diet, but we assume that if inspection is an important means of protecting the consumer of beef, this precaution is even more essential to guard consumers from the dangers that may be concealed in horse-flesh.

One of the most common and incurable diseases of horses is known as glanders. It is communicable to man and in him is a most loathsome and fatal malady. The presence of this one disease of horses in all parts of the country, is a sufficient reason for forbidding the slaughter of these animals with a view of selling their flesh for human food unless they are inspected before and at the time of slaughter by competent veterinary inspectors. But an additional reason for inspection is the well-known fact that it is generally broken down and diseased, rather than sound and healthy, horses which are used for this purpose.

Unfortunately, the federal inspection is limited by the statutes to cattle, sheep, and swine, and cannot properly be extended to horses. Their flesh may consequently be prepared, shipped, and sold without inspection and without the violation of such laws. Our sanitary authorities owe it to the public, however, that this meat be sold for what it really is, viz., uninspected horse-flesh.

The secretary of agriculture has recently made an order requiring all meat shipped abroad to be either inspected or plainly marked to indicate the species of animal from which it is produced. This is done under the law which authorizes the inspection of all exported beef. A similar requirement might be made for meat shipped from one state to another, but would only be a protection in case the local health officers coöperated with the inspection service of the general government. Otherwise, the marks would be removed before the meat was sold and it would then, as now, be sold to the consumer as the flesh of the ox.

Your committee asks attention to these several points not because they are new or unknown, but because they demonstrate the importance of an extension of active sanitary work to guard consumers from the dangers of unwholesome meat. The establishment and extension of the federal meat inspection make coöperation feasible, and present the only practicable means of securing a thorough and efficient system of meat inspection. In our opinion the subject is a timely one and should receive immediate consideration from boards of health in all parts of the United States.

DISCUSSION ON THE REPORT OF THE COMMITTEE UPON ANIMAL DISEASES AND ANIMAL FOODS.

Dr. P. H. Bailhache, of New York.—I merely wish to remark that the inter-state law spoken of was drawn as close as it could be for the protection of local sanitation of domestic animals, but under our form of government it was found impossible for the federal government to step into any state or town and undertake to say what meat shall be slaughtered until the cattle were thoroughly inspected. It is only with reference to the transportation from one point to another that the government has any right to do anything.

Dr. Carl Weidner, of Louisville, Ky.—I simply rise to take exception to one remark in the report. I cannot endorse the statement that the inspection of pork for trichina is entirely inadequate or useless. I think that the consumption of all trichinous meat ought to be prohibited, as much as possible, still it has been sold for years and years. While it is our duty to instruct the public, it is also our duty to protect the people, to urge and demand a rigid inspection of pork, and I am sure by so doing we will detect trichinae in a great many instances, and point out that the sellers of such infected meat are liable.

DR. C. N. HEWITT, of Red Wing, Minn.—Being associated with Dr. Salmon more or less, I wish to say a word or two in reference to this matter from the standpoint of a health officer. Dr. Salmon assumes that nothing is being done except by himself and the local anthorities who are in sympathy with him. For the past three years he has been supplying the state board of health of Minnesota with tuberculin and mallein, and these agents have been used in large quantities by the local departments of health for the detection of tuberculosis and glanders. Over one thousand animals, suspected of tuberculosis, were tested by the use of tuberculin under the direction of our state board of health. Inspection between the state and the nation can be easily arranged, if the national and state authorities are faithful. We do not have any difficulty in getting the coöperation of Dr. Salmon and his department and we coöperate with him. We can avail ourselves of his services, and his recommendation is to do so. It is the practical way to solve the problem. It is successful, so far as we have gone, and I hope my brethren of the other states will try to do the same.

DR. J. J. KINYOUN, of Washington, D. C.—I rise to say one or two words. While endorsing in the main the report of the committee, of which Dr. Salmon is chairman, in regard to inspection of infected meats, I do not believe there is enough emphasis laid upon the subject of tuberculous meat, either in the bovine or in the swine species. If we will carefully read the report of the British commission on tuberculosis, I think we will come to the same conclusion as that advanced by Dr. Salmon, that while in the greater number of cases we can detect tuberculosis by the tuberculous glands, we cannot be sure that by excluding certain parts infected with tuberculosis, we can exclude all the tubercle bacilli in that class. Even in the animal, where only glands are infected, the carcasses are dangerous and should be destroyed, and as long as we shut our eyes to the conditions, as set forth by the bureau of animal industry, we are going to invite tuberculosis through infected meat.

DR. H. N. AVERY, of Minneapolis, Minn.—In relation to this matter of detecting tuberculous meat in cattle, and also the detection of swine fever and cholera in hogs, it seems to me that nothing but inspection by local health officers can ever prevent the consumption of these meats. For instance, you might have state or national inspection, but here are a great many farmers scattered over the country who are raising hogs with either hog cholera or swine fever. If they notice the swine are weak in the legs, what do they do? They slaughter them and bring them to the local market for sale. How are the national inspectors going to detect it? Therefore, it seems to me nothing short of local inspection by the health officers or by the meat inspectors of municipalities should be instituted in order to be able to detect this meat.

In regard to tuberculosis in cattle, I think probably that Minnesota has had as much experience as, if not more than, any other state in the Union. Dr. Hewitt has been active for the last ten or fifteen years in this matter- and Minneapolis has within the last sixty days tested nearly 500 head of milch cows for tuberculosis, and there is only one way to eradicate this disease from the human family. We all know that tuberculosis is communicated from one person to another in three ways: (1) By the sputa, (2) milk of cows, and (3) the cheese and butter that may be produced. The only way to eradicate the disease is by the tuberculin test, which is the only infallible one, and nine times out of ten you will detect it in animals.

THE MICROSCOPICAL DIAGNOSIS OF DIPHTHERIA BY A NEW STAINING METHOD.[1]

By H. C. CROUCH, M. D., of Colorado Springs, Col.

The diagnosis of diphtheria by the microscopic examination of cover-glass preparations from the membrane is admittedly imperfect. By the ordinary method, we are obliged to rely upon the occurrence in large numbers on almost pure cultures of bacilli having certain morphological peculiarities, which, however, are not sufficient to distinguish them from other bacilli found in the mouth, if such are present in any quantity. A method which would give a specific stain, as with the tubercle bacilli, would evidently be of the greatest importance. Such a stain has not yet been found. Fortunately it is not necessary to have a stain so specific as to detect single diphtheria bacilli, for they are invariably present in a certain quantity if present at all. A method which will detect certain of them with some degree of certainty would be sufficient in most cases, and such a method, it seems to me, I have found. At least, if used with the proper precautions, and with sufficient skill, I believe from my experience with a large number of cases that this method will suffice to determine the diagnosis in a very large percentage of cases.

The diphtheria bacillus as seen in preparations from cultures consists of bacilli of varying sizes, the larger ones particularly presenting characteristic features in the way of club-shaped ends, and irregular staining, but all forms showing a tendency to the alternation of deeply and lightly stained portions. In addition to this and distinct from it, are certain round or oval bodies, which may be made apparent by certain methods, the existence of which was brought to our attention by Babes, Neiser, and Ernst. The method pursued by the latter was to stain strongly with hot methylene blue, and follow this with Bismarck brown. These bodies would be blue, the rest of the bacillus being brown.

I have been investigating the feasibility of employing this peculiarity of the diphtheria bacillus to differentiate it from other bacilli found in the mouth, and with a degree of success beyond expectation. I have found likewise simpler methods of staining, and peculiarities which I believe to have escaped attention hitherto.

If a fresh serum culture is stained momentarily with a one per cent. solution of methyl green it is often possible to bring out these bodies without further treatment. Treated thus they have the peculiarity of reddish granules in a faintly green bacillus, usually one at each end. By staining with methyl green more strongly and following with methylene blue, blue bacilli with red dots resembling spores will be seen. These bodies have, apparently, a peculiar affinity for methyl green, with which they enter in a chemical combination, resulting in change of color from green to red. I have consequently employed methyl green for their detection. By adding other colors the penetration of the methyl green may be increased, and a double stain obtained immediately. I have found dahlia most useful, and employ in the following proportions: 1 part of one per cent. dahlia in water, 5 parts one per cent. methyl green, 4 parts water. If either color predominates in the stain too decidedly, the other color is cautiously added until the desired result as tested on the bacilli from a culture is obtained. The stain works instantaneously, and if too deep the effect is not obtained. In such a case the cover-glass may be treated quickly with Bismarck brown, which replaces the dahlia in the body of the bacillus, leaving the bodies described standing out in contrast.

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[1] Presented at the Denver meeting.

I have tested this method on a large number of cases during the last six or eight months, and have never failed to find the result of the culture positive where I found these forms present in the cover-glass examination. In one case where I had diagnosed diphtheria, the first culture was unsuccessful, but the second culture which I had taken confirmed the diagnosis, which fact seems to me to indicate that the direct examination should always have its place in addition to the culture.

These bodies I do not consider to have any connection with spores, in spite of their superficial resemblance. They are found in the greatest numbers in young, freshly growing cultures, and are much less abundant in older cultures. They may be readily detected in cultures only a few hours old, and thus made use of to confirm a diagnosis earlier than the full development of the culture. That they are not degenerative forms is evident from the same considerations. I incline to attribute a nuclear nature to them, and propose the name nucloid bodies. They are evidently connected with the active growth, and are absent in the resting forms, suggesting thus the resemblance with indirect cell division. Being particularly abundant during the earlier and more rapid growth they are readily found in the earlier stages of the disease, and from the ease with which they may be brought out they acquire, it seems to me, a very great practical importance in the microscopical diagnosis of diphtheria.

DISCUSSION ON DR. CROUCH'S PAPER.

DR. CHARLES V. CHAPIN, of Providence, R. I.—I would ask Dr. Crouch in what proportion of cases he has detected the presence of the diphtheria bacillus by the method he has detailed.

DR. CROUCH.—I have detected its presence in something over eighty per cent. of the cases, as confirmed by cultures; that is to say, I have been successful in making diagnoses in eighty per cent. of the cases.

DR. J. J. KINYOUN, of Washington, D. C.—I have had some experience

THE MISSISSIPPI RIVER AS A SEWER.

By JOSIAH HARTZELL, PH. D., CANTON, O.

The subject under review suggests some observations; first in regard to certain vexations arising from river pollution in the several states of the United States; second, the present status of the same; third, possibilities in the future; fourth, remedies.

A community afflicted by an outbreak of disease appeals for assistance to the state board of health. If the disease is due to unsanitary conditions existing within a territorial area over which the state board has control, the causes of complaint are sought after, and, when found, are abolished. But if the outbreak is due to causes emanating from a territory outside the boundary of the state, the aspects of the case are changed in a very important particular. It is to complications of this character, arising from a divided political control of territory, that I wish to ask your attention.

A convenient illustration is found in the action of the Ohio legislature, as shown by the following, copied from the proceedings of that body, April 8, 1891:

> WHEREAS, the water supply of the towns and cities of the state bordering on the Ohio river is rendered impure and unhealthful by the sewerage and excreta emptied into the streams from the numerous cities upon both sides of the river, and
>
> WHEREAS, in consequence of this pollution, a scourge of diphtheria and typhoid fever has swept over many of our cities in eastern Ohio, resulting in much sickness, therefore, be it
>
> *Resolved by the General Assembly of the State of Ohio,* That the State Board of Health be requested to prepare a report to be submitted to the General Assembly as to the source of greatest danger from the causes above recited, and also what investigation would be required and what action should be taken in order to secure a purer water supply for the people of the river counties.

The Ohio board had already investigated a number of epidemics that had occurred in river towns and cities. The causes of these had been traced to polluted water supplies, the pollution having been derived partly from Ohio territory, and partly from cities above, and on the other side of the Ohio river. Intra-territorial sources of contamination were promptly suppressed.

The secretary of the board was directed to correspond with the secretaries of the state boards of health of Pennsylvania, West Virginia, and Kentucky, with a view to arranging for a joint meeting to discuss the question of pollution of the Ohio river and its prevention. Correspondence and meetings ensued, but the evil, the divided control, the variety of method where there is any method, these remain. The situation cannot be remedied by correspondence and meetings. With the increase in urban populations, and the added drainage of cities, the rivers become filthier year after year.

The features of Ohio history, thus briefly alluded to, have, to a greater or less degree, characterized other states constituting parts of the great Mississippi basin. The Mississippi bisects this basin, receiving into itself 600 affluents which drain a water-shed area of 1,257,545 square miles. The coast line of the river and its navigable tributaries exceed 32,000 miles. These waters penetrate regions from which one third of the arable and other industrial products of the United States could be shipped to all parts of the globe.

The average slope of eastern rivers towards the Mississippi is three inches to the mile, of western rivers six inches. The fall from Cairo to the gulf is about two and one-half inches. In pre-glacial times the Gulf of Mexico extended north to a point above the mouth of the Ohio, having, in this part, much the shape of the Gulf of California of to-day. The alluvial lands, which have now taken the place of the open sea, constitute the garden spot of the earth. They have been brought down from hill and mountain, atom by atom, and dropped on the way by the slowly moving waters.

Within the memory of not very old men, it may be said that the waters of nearly all these streams were, if not pure, at least generally exempt from hurtful pollution. With railroads and the consequent concentration of people in towns and cities, the increase of water defilement has intensified prodigiously.

Sewers have as their object the collection and swift removal of city wastes. The effluent goes into the nearest available water. It therefore happens that sewers which, when rightly constructed, have their warrant in the soundest of hygienic impulses, also go concurrently hand in hand with the most concentrated form of river pollution, as now generally managed.

It may be said that the drainage of the entire valley must reach the river by gravity. While that is conceded, it is also true that the impurities reaching the stream through the medium of waters passing over, or through, land surfaces, are not apt, either in character or degree, to merit the charge of pollution. Impurities derived from vegetation or earthy salts have no particular significance, but if these impurities consist of the excreta of a dense population it is far otherwise. In addition to excreta, other serious forms of pollution do often reach these rivers. In a report on garbage disposal made to the American Public Health Association by Dr. Kilvington, health officer of Minneapolis, in 1889, this subject is discussed. Dr. Kilvington had interpolated the health officers of one hundred and seventy-five cities. A portion of the data thus obtained is summarized as follows:

In the Mississippi river, eight cities alone deposited, during the past year, 152,675 tons of garbage, manure, and offal, 108,250 tons of night soil, and 3,765 dead animals.

Into the Missouri river, four cities alone have cast, in the same twelvemonth, 36,110 tons of garbage, manure, and offal, 22,400 tons of nightsoil, and 31,160 dead animals.

Into the Ohio river, five cities alone dumped, within the same period, 46,700 tons of garbage, and offal, 21,157 tons of night soil, and 5,100 dead animals. (The night soil here referred to was derived from privy vaults.)

Recall the fact that a large proportion of these animals have been killed because they were suffering from glanders, farcy, hog-cholera, hydrophobia, pleuro-pneumonia, and tuberculosis, multiply these figures by the lowest possible multiple, and add to this great mass of decomposing material some thousands of miles of sewerage discharged into these three rivers, and the mind can form some dim conception of the degree of their pollution. No theory of self-purification of running water will suffice to dwarf the magnitude of this sanitary crime.

Having thus, most briefly and imperfectly, it is true, alluded to present existing conditions, the mind involuntarily busies itself with prognostications as to the future of the Father of Waters. If present practices are to continue, these would furnish the basis for at least a rational calculation of the probabilities affecting the case. Successive enumerations of urban and rural populations in the past furnish ratios of increase which, taken as a whole, admit of the ascertainment of the degree of potentiality of probable contributing factors at stated periods in the future. It may be observed that estimates of degree of future river pollution based on present methods, and previous rate of increase of population, would give a weak result as compared with the facts in the case, because, first, of the growing tendency of people to concentrate in cities, and, second, because of the great impetus recently given to sanitary works, sewer construction, and the prevailing efforts to deliver sewerage in concentrated form.

The calculation just suggested will not be attempted here. The general topography of the Mississippi water-shed, and its tributaries, its climate, soil, minerals, and possible capabilities are well understood. This great valley, already the home of a mighty people, is destined to be the theatre in which human achievement will one day attain to its point of utmost endeavor. Its territory is larger than Central Europe. China's 400,000,000 of people live within smaller and less fertile limits. The civilization of Egypt, which has been the wonder of the world for forty centuries, attained its greatness by the cultivation of less than 10,000 acres of the Nile valley. What shall be said of the Mississippi valley with its 800,000,000 of fertile acres, all lying within the temperate zone, equally removed from the lazy tropics and the northern ice, naturally favorable in every part to health and long life, to prosperity and happiness?

But along with people, in these latter times, comes trouble. People have drifted away from the example and injunction of Moses in disposing of their wastes. For the most part of a century they have been casting it into and befouling the waters of this once glorious system of rivers.

farther into the lake until the distance of four miles was reached. Even at that distance the water was, at times, found to be polluted.

An effort was made to improve the condition of the Chicago river by locating pumps at a point above the outlets of sewers, and lifting enough water into the Illinois and Michigan canal to cause an inward current of clean water from the lake. In dry weather the river was slightly improved. The pumps were powerless against storm flows which pushed the water body of the river out into the lake, defiling it over large areas. The sewage water which was pumped into the canal flowed westward, reaching the Illinois river at a point above Joliet where the water level of the river was a few feet below the level of Lake Michigan.

The future welfare of Chicago rendered it imperative that some great enterprise be undertaken for the protection of the city's water supply and, incidentally, of the public health. That which might have been done furnishes an interesting subject for speculation. Cities considerably larger than Chicago purify all their sewage by various processes, or filter their water, or both. Everyone knows what was done. It was decided to excavate a canal connecting Lake Michigan with the head waters of the Illinois river. This canal is to be capacious enough to permit the flow, not only of the city's sewage, but also of a large volume of lake water.

A few miles west of Chicago the Des Plaines river, reaching that point from the north, bends to the west and runs to Joliet. Thence southward the stream is known as the Illinois river. The descending grade in the channel, which follows the general course of the Des Plaines, is very small the first forty miles. The descent from Joliet to Utica, a distance of sixty miles, is about two feet to the mile. In the entire remaining channel of the Illinois, 240 miles in length, the fall is thirty feet, about an inch to the mile. In the course of the river are many basins favorable to sedimentation.

There is no precedent for such a work by a city of the first class. The city of Berlin employs its sewage for irrigation and purifies it by absorption through land. Paris is introducing the same system. The London sewage is moved a distance of twelve miles, is partially purified, and cast into the sea at ebb tide. There is really no short cut by which escape from measures forced upon older countries, for the conservation of public health, can be regarded as permanently possible in America.

Nor is there any precedent for such disposal in America. A strong current washes the frontage of New York and Brooklyn, carrying the water body, not in the direction of inhabited districts, but out toward the open sea. The Boston sewage is conducted to Deer Island Light, a distance of eight miles, and delivered into the open sea.

More apt parallels, in a sanitary sense, may easily be constructed by the imagination as, for example, in supposing the sewage of Berlin carried to the head waters of the Elbe; or that of London conducted northwardly through England and Scotland to the sea; or that of Paris delivered into some tributary of the Rhone; or that of New York carried

110 deaths, all derived from one case, as at Plymouth. If dilution enables 5,000 to escape, leaving only one unhappy victim in whose Peyer's patches the virulent organism may form a new nidus for the propagation and dissemination of its frightful capabilities, ought not such dilution as that to be everlastingly condemned?

The several states of our national Union constitute one family; and family government is not without its perplexities. All the children do not take to education with equal kindness. The big bullies boss it over the weak. But that healthful growth which assures future well-being demands the adoption and enforcement of salutary restrictions for all, and equally for the benefit of all. Uncontrolled lawlessness and heedlessness bring disaster.

The fever-plagued cities of Western Pennsylvania should change their methods. The report of the joint commission of the cities of Pittsburgh and Allegheny exposes their sad condition, their unwholesome practices. They drink their own sewage. They have made an open sewer of the Ohio river. They should purify their sewer streams and filter their drinking water. The same course should be pursued by the sewered cities of West Virginia and Ohio, and Kentucky, and Indiana, and Illinois, and Minnesota, Wisconsin, Iowa, Nebraska, and Missouri. Think of the damage done by waste of fertilizers, and of the incomparably greater damage to physical well-being. It is wrong to convert the Mississippi into an open sewer. It is rational to hope and believe that these inland streams will be reclaimed and protected from pollution by the strong hand of government power.

But now, while boards of health are seeking remedies from these very ills, already grown potent enough to call for, constant vigilance against their encroachments, we see this menace from the great city on the lake. The added pollution caused by the wastes of more than a million of people is to be thrown upon these waters; upon communities and interests that have had no part nor lot in its production, and which were protected against it by a natural barrier which it is costing more than a score of millions to remove. There is nowhere any record of a crime against health that can equal this in flagrancy. It is wholly out of harmony with the enlightened spirit and the best engineering practice of this age.

The instigating cause, an effort to obtain pure water, cannot be too highly commended. That concerns the municipality. Other cities, having already many difficulties to cope with, also desire water improvement. By way of palliation the river cities were assured that the dilution of the sewage in lake water would be a sufficient remedy. This claim had in certain seasons of the year, a seeming justification by the conduct of the greatly diluted sewage lifted from the Chicago river by the Bridgeport pumps. That sewage, very small in amount comparatively, had been cleaned of its heavier contents by primary sedimentation. The new drainage canal is planned to receive the crude sewage effluent. The tougher and grosser parts, buoyed up for a time by the ferments of decomposition, especially in the periods of warmer temperature, will float, and hug the shore, very much to the latter's disadvantage.

The effect of other inevitable processes, additional to dilution, deserves consideration. The reports of the Mississippi River Commission, created by act of congress, June 28, 1879, sufficiently indicate the importance of sedimentation as a factor, and as a feature of running streams. Following putrefactive changes the solids, during dry times and a sluggish flow, settle to the bottom of the upper stream, somewhat to the advantage of those below. High water scours out and carries the sewage mud downward to the relief of those above. In this manner the accumulations of a number of months would be swept downward into the Mississippi in a few days. It would be interesting to know how far down stream a water supply should be located in order to be free from contamination under such conditions.

The objections to sewage water, under specific conditions, shrink somewhat with lapse of time. Pathogenic, water-borne organisms are much shorter lived in sunlight than in the dark. Nitrifying agencies act effectively when the exposed water surfaces afford a plentiful supply of oxygen. If sewage is immersed in water at a low temperature, and occluded by ice from solar and atmospheric modification, its capacity for mischief remains indefinitely unchanged.

The scope of this review does not comprise mention of the technical engineering features of drainage enterprises. The relations of sewer effluents to health, and to public control, only, are under consideration. It seems that the people on the Illinois river were awake alike to their danger, and to the rights and wrongs of the case. Five and six years ago meetings were held in several of the cities. In these meetings the cities of Peoria, La Salle, Morris, Ottawa, Peru, Lockport, Seneca, Marseilles, and Joliet were fully represented. The drainage scheme was denounced by pointed resolutions. Legal measures were instituted and carried through to a decision of the state supreme court. Another committee, consisting of the mayors of the several cities, endeavored to prevent legislative sanction of the enabling acts. Their efforts were without avail. Chicago was too powerful. But the United States is more powerful than Chicago.

The laws of the several states would afford all needed protection if they were enforced. Chapter 38, paragraph 277, of the criminal code of Illinois reads as follows: "It is a public nuisance to throw or deposit offal or other offensive matter in any water course, lake, pond, etc., . . . to corrupt or render unwholesome or impure the water of any spring, river, stream, pond, or lake, to the injury or prejudice of others."

Paragraph 278. "Every such nuisance, when a conviction therefor is had in a court of record, may be abated by the sheriff or other proper officer, and it shall be no defence to any proceeding under this section that the nuisance is erected or continued by virtue or permission of any law of this state."

The language of the Ohio statute is about the same, and its provisions are the same.

The statutes of all the states contain similar provisions. These fundamental laws embody man's innate sense of justice. The language of the federal law concerning the navigable waters under governmental jurisdiction is equally explicit, as witness the following, copied from section 6 of the River and Harbor Act of the United States, Sept. 19, 1890:

"It shall not be lawful to throw, or empty, or suffer to be done, any filth, refuse, or other waste of any kind into any port, harbor, navigable river, which shall tend to impede or obstruct navigation; or to deposit any filth or other waste in any place on the bank, where the same shall be liable to be washed into such navigable waters."

The text-books are equally explicit. Lewis, on "Eminent Domain," pages 65 and 86, has the following:

"The general right to the flow of a stream in its natural purity is fully established by the decisions. A company supplying a city with water cannot take the water of a stream and return an equal amount of inferior quality to the damage of the lower proprietors."

"There is no principle which allows a city to conduct into a stream, by means of sewers, the water and filth which comes from a dense population."

"There is no riparian right, even to cities on its banks, to cast filth into a stream.

"One proprietor upon a small stream would not be permitted to place his privy over a stream, or turn into it the refuse from his kitchen and stable; no more can a hundred proprietors of a large stream, or the corporate authorities of a city through which it runs."

Angell on Water Courses, paragraph 545, says:

"A municipality has no more right at common law to pollute streams with sewage than a private person, and its duty to prevent public nuisances by taking care of the sewage gives it no right to create another nuisance by the pollution of a stream."

Wood on Water Courses, paragraph 546, says:

"Even if sewage has been discharged into a stream for several years, but in quantities not producing perceptible injury, it confers no right to afterwards increase it so as to cause serious injury."

Addison on Torts, paragaph 1,049, edition of 1876, says:

"Boards have no power to collect sewage and pour it into a stream which was previously pure, so as to create a nuisance, or deteriorate the value of the land adjoining the stream * * * cities are not entitled to foul the rivers with the contents of water-closets and convert a stream into a stinking sewer."

Even the state reports of supreme court decisions interpreting law have, until within recent years, left no cause of complaint. An example is the following, by the supreme court of Illinois, in the city of Jacksonville v. Lambert, vol. 62, page 519. It says: "No one would suppose that a it. I copy the following from page 13, Annual Report of the Pittsburgh Bureau of Health, which appeared about July 1, 1895:

"When the boat is full (of garbage) it is floated a short distance below the city, and its contents dumped into the river. This boat and the manner in which the material is disposed of, has been a source of annoyance to many of our citizens and a cause for many complaints; one of which has been presented to the national government at Washington, protesting against the depositing of garbage in the river."

Urged thereto by cash considerations certain mathematicians have worried themselves over calculations as to the exact distances at which the smile of purity would shine again from the face of a stream that has been ill with sewage. Perhaps these philanthropists would favor us with some equally reliable data on garbage. Given, a boat's cargo of the refuse of stables, of stale fruit, of tainted meat, of dead dogs and horses, dumped into the Ohio river three miles below Pittsburgh; also, given a velocity flow of two miles an hour: how far down the river would these substances be in a healthful state for introduction into the human stomach with the water at a temperature of 50 degrees, at 40 degrees, at 35 degrees? I will spare him further figuring, for everyone knows that with an icy guard the products of organized life go unchanged around the whole earth.

And yet cities below do drink this water summer and winter. It goes into their houses at Wellesville, Martin's Ferry, and Bridgeport, and Bellaire, and Wheeling, and Ironton, and Portsmouth, and Gallipolis, and Cincinnati, and Evansville, and Louisville, and Paducah, and onward into the great Father of Sewers. The nooks and eddies in the Ohio that were once the angler's joy are murky with pestilence. Strange forms and indescribable mud crawl into and over them and the *beggiota alba*, filthy fern of sewage-laden water, trails its portentous drapery over rank wastes of rottenness and decay.

The real father and owner of these waters is the people, and the people's duly constituted authorities should come to our help, and come quickly. Here and there communities are combatting the pollutors. To a certain extent the Ohio state board of health has been equipped for this work by a law of the legislature passed March 14, 1893, which reads as follows: "No city, village, corporation, or person shall introduce a public water-supply or system of sewerage, or change or extend any public water-supply or outlet of any system of sewerage now in use, unless the proposed source of such water-supply, or outlet of such sewerage system, shall have been submitted to, and received the approval of, the state board of health."

The average legislator is not a sanitarian. His study has been to get office. Years of vigilant effort must precede such laws. Other years are needed to secure ready acquiescence. The example of the government in permitting the pollution of its navigable waters to that extent paralyzes the efforts of boards of health.

The evils of stream pollution have frequently been brought to the attention of this association. The special committee of the association in 1888 consisted of Charles Smart, S. W. Abbott, G. C. Ashmun, W. W. Daniels, and Edward Playter. The dangers and wrongfulness of river defilement were most forcibly depicted by this committee, which recommended the following resolution:

"*Resolved*, That it is the well-considered belief of this Association that it is an imperative necessity, especially in the more populous states, that state legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water-supplies, and with power to preserve these waters from contamination by sewage or other injurious matters."

This committee also declared that river waters into which sewage had entered could not thereafter be regarded as a safe source of water-supply.

Consequent upon the enactment of the Ohio law above referred to, the free delivery of raw sewage effluents into interior streams has been largely suppressed. In the navigable rivers traversing several states, it goes unvexed to the gulf. The government should put a stop to the pollution of its rivers. When the Mississippi needed improvement in respect to navigation, and riparian protection from floods, the Mississippi River Commission was established. The National Maritime and Interstate Quarantine Law, passed by congress January 13, 1893, is comprehensive and mandatory. It is national in character and interstate in operation. Americans sleep secure from appalling explosions of cholera and yellow fever. But those are not all, nor the worst. Professor Vaughan said in a recent address: "Typhoid fever destroys more citizens of the United States every year than cholera has destroyed in the last fifty years. In the United States 40,000 die from it every year, and there are sick with it 400,000. This means a money loss to the community of $40,000,000 every year. Suppose some foreign foe would rob us every year of forty million dollars; we would be up in arms. There would no longer be any trouble with the surplus; we would expend it righting our wrongs. But what is our government doing to-day? While every other government has a national board of health, ours has none. Every shore has its light-houses; we spend millions of dollars for the study of meteorological conditions and the diseases of animals. The United States has spent more money in the investigation of hog cholera than it has in the study of any of the diseases which man is heir to."

The commerce and interests of the marine people are protected and fostered by the coast survey, by the fish commission, and by many other specific forms of exercised authority. See what has been done for England by the rivers' pollution commission, for Germany by the Imperial board of health. Read and compare the typhoid percentage of those countries with those of the Mississippi valley cities. Is it not high time that Uncle Sam instituted a rivers' pollution commission for the protection of his own children?

There is not room in this review to present more extended evidence of river defilement. Attention has been mainly given to practices and projects affecting two of the eastern influents of the Mississippi. It cannot be doubted that the waters of the great river are seriously menaced on the north and west. Sewage purification is entirely feasible, and is a thoroughly established department of modern engineering. Every river of consequence on the Atlantic slope, between the Androscoggin and the Potomac, participates in its benefits. Purification of sewage effluents by irrigation is becoming the rule on the Pacific slope, where the paucity of rain-fall, and the economic value of moisture, furnish an added incentive.

It is true we have laws and legislatures and courts. The laws are good, but they are dead letters, just as much in legislatures and courts as elsewhere. It is not laws, but the disregard of them, that causes trouble. The Illinois cities organized, and expended their utmost efforts to keep the sewage of Chicago out of their valley; but they are to have it, all the same, and by legislative permission. A supreme court opinion, filed June, 1890, uses this language in regard to the drainage project: "It will cause a large flow of water from Lake Michigan through the proposed channel into the Des Plaines and Illinois rivers, for the purpose of diluting the sewage and rendering it innocuous to those living along the course of those streams."

Discouraging as is the perpetration of such abominable stuff by a supreme court, and disheartening as it must have been to those whose health and property interests were at stake, such acts should cause no surprise. This judge was honest. He was not a sanitary expert. He knew no better. Interested attorneys had plausibly preached the dilution formula for the production of innocuousness and he believed it. All who have the conservation of the public health at heart should reach out for government help. Congress ought to establish a commission composed of competent men and should equip the same with ample authority. Such a board would be sheltered from popular reprisals. It could elaborate plans for the disposal of these vexatious problems that would be in harmony with the best results of applied science, and with the terse old Anglo-Saxon maxim that "no man has a right to injure his neighbor."

RIVERS CONSERVANCY BOARDS.—FROM THE INTERNATIONAL STANDPOINT.

By PETER H. BRYCE, M. D., Toronto, Ontario.

In bringing this subject before the attention of the Association, I am well aware that I am dealing with a matter which has not the same or an equal interest for all the members of the Association; yet on the other hand, I assume that the comprehensive character of this Association is such as from its very nature makes it especially fitted to discuss this, as all other questions having an interstate and, still more, an international bearing. I have further been, and am still, very conscious of the many practical difficulties attaching to any scheme which may be proposed for dealing with such questions, and am not ignorant of views which have already been expressed as to the impossibility of any successful efforts being made in this direction. If, however, we view in retrospect the progress of the Association, if we recall results of the efforts made towards interstate and international co-operation in measures for dealing with outbreaks of contagious disease, and if we remember that we have had, and still have, active committees dealing with such questions as the pollution of streams and the protection of public water supplies, it must be apparent, that the natural outcome of such labors will be to make evident the possibility of giving a practical direction to the conclusions which are the results of such efforts. I hold as true the laureate's words:

> "Yet I doubt not through the ages one increasing purpose runs,
> And the thoughts of men are widened with the process of the suns."

In order, then, that we may clearly comprehend the practical importance of the subject, we must recognize the causes which are at work changing the character of our lakes and streams from one of original purity to that of waters receiving the excrementitious products of millions of people living upon the shores or living in floating habitations upon their ample waters.

From the census returns of the last three decades, I find the following as seen in the tables appended to this paper to be the ratio of increase of the population of the states bordering on the Great Lakes.

In a paper presented to the International Conference of Health Officers in 1891, I pointed out, textually and diagramatically, that the local pollution then at work in the lake-side cities, had been instrumental in definitely raising the death-rate from typhoid fever in every city where local pollution of the water supply was possible, either from its own sewage or from that of neighboring cities. When I further point out, that notably on the two chief international streams, the St. Clair and the Detroit rivers, and the Niagara river, the populations have on the two banks, increased in twenty years as set forth in the appended tables, it must be apparent that the pollution of these streams must shortly, if it has not already, arrive at such a point, that disastrous results cannot under present methods be long averted.

With regard to most of the streams of the continent, whether state or interstate, it must be generally accepted that the danger line has long since been passed, and that many city and town populations are now face to face with problems which are demanding the most serious attention of all engaged in public health work, whether municipal, state, or national. Dealing with the cities of the two principal international rivers situated as they are along the greatest fresh-water highway of the world, it is apparent that with a commerce passing by them and in which they all play a more or less important part, they are destined to become still more important factors in creating for one another dangers to which it would be criminal to shut our eyes; and owing to their international character it must be obvious, that the part that any one city, on either side of the border, may play in the injury caused to a neighboring town or city will vary according to the accidental relation which its location may have to that of the other.

These are illustrated by the following examples:

At Port Huron and Sarnia, the current from the west side flows within a short distance close to the Canadian shore; the sewage of Walkerville pollutes the public supply of Windsor, and the sewage of Detroit and its garbage indicate their presence at times fifteen miles down stream at the intake of the Amherstburg water supply.

On the Niagara river the total sewage of Buffalo and the total dredgings of the harbor and docks, amounting to thousands of tons daily, are poured into a stream with a current at from three to seven miles an hour, from which in a total length of thirty-two miles, some six large towns take their public water supplies.

So far as the very imperfect returns of deaths from these municipalities on both sides of the border indicate, no very notable increase in the typhoid death rate is yet apparent, but the epidemic of Sarnia of 1882, the somewhat high typhoid death rate of Windsor, and the brief explosion of typhoid in Buffalo in 1894, all indicate that the danger is only temporarily averted by the accidental situation of some towns and the great dilution of sewage in the case of some others.

It may be of interest to measure comparatively this dilution. In examining the details of the great Chicago Sanitary Improvement Canal, I find that when used at its full capacity the canal will discharge 600,000 cubic feet per minute.

From a calculation based on the government engineer's reports as to the width, depth, and rate of flow of the Detroit river, at Detroit, I find that it has a discharge equal to not more than twenty-five times that of the great Chicago canal. Most of us are familiar with the prevalence of typhoid which existed in Chicago for years prior to 1892, and I am informed that in several large areas of the city, such prevalence of typhoid has recently re-appeared owing to contamination of the water supply of that particular district. When it is remembered that the daily excrementitious products in sewage of a mixed population amount to 2.5 ounces of dried fæces and 40 ounces of urine and that in the year 1892 the daily consumption of water in Chicago was 353,500,000 gallons, we can in some degree appreciate the extent to which pollution may extend, even in these great bodies of water.

It seems therefore impossible to avoid the conclusion that, when in addition to the sewage proper these international streams are at times polluted by garbage deposited from scows and from dredgings regularly dumped therein as at Buffalo, such a criminal disregard for the lives and interests of the people of the towns is being shown that the time at which the toleration of such acts can no longer be overlooked, has already arrived, and that it is high time that the question as an international question were taken up by the federal authorities of the two nations and by the states and provinces immediately interested. The question is increased in importance by the fact that an inland marine so great as to have some 300 vessels, as barges, sailing vessels, steamers, and excursion boats with thousands of passengers daily passing through the Detroit river, adds an element of pollution, especially to the stream which, under present methods of disposal of the excreta therefrom, becomes permanent in character, and which under certain circumstances may be fraught with serious danger to public water supplies, as several years ago was illustrated by an outbreak of typhoid fever in Sault Ste. Marie, owing to a large number of vessels having an enforced anchorage at the mouth of the canal, in the vicinity of the intake of the water pipe of the town.

Without, however, further illustrating the situation or its needs, it remains for us to consider the possibility of having some scheme developed, which will deal in some systematic manner with the problem through the coöperation of the several authorities especially interested.

It is quite apparent that those cities situated by accident at the entrance of the several rivers, being themselves largely free from immediate danger, are, in keeping with common experience, but little likely to trouble themselves seriously regarding the question. This is illustrated by the past action of both Detroit and Buffalo, and of Walkerville, all situated so as to obtain a water supply direct from the lakes. The necessity for action must therefore be made apparent to our several legislative bodies before any concerted action can become possible. All are aware of how Chicago has been able to convince the legislature of Illinois of the necessity for turning a stream of one twenty-fifth the volume of the Detroit river and polluted with the sewage of 2,000,000 people, into the inland waters of the state, at the same giving to the whole scheme the euphemistic title of "The Sanitary District of Chicago." It may be that the cities of the Mississippi valley will be willing to receive this contribution of Chicago's substance for the sake of the promised addition of one foot to the average depth of the "Father of Waters;" but the fact illustrates how all governments are prone to delay action until too late to supply an adequate remedy for evils whether commercial or sanitary. That preventing the pollution of streams is difficult, is realized when we view the very inadequate remedies which have been applied to polluted streams in those countries of Europe, where the cities have large and dense populations. In England, however, much has been attempted and something done. As early as 1848, with cholera past and present in mind, stringent laws against the pollution of streams were passed. Again in the Royal Commission's Report of 1865, strong ground was taken as to the positive dangers from polluted water supplies; and in the consolidated Public Health Acts now in force, the following general and far-reaching provisions exist:

Nothing in the act compelling the disposal of sewage, shall authorize any sanitary authority to make use of or use any sewer or drain for the purpose of conveying sewage into any natural water course or stream. The procedure under this act is simplified and cheapened so that action against offending cities can be taken before the judge of any county court; and by the act of 1890, a per diem fine of £10 may be levied against any person or corporation for discharging chemical wash or other liquid which causes a nuisance or is injurious to the public health.

Whenever the order of the local government board requires extended sanitary improvements, time is given for completing the same, but any defaulting municipality is liable to a fine of £50 per diem, and where continued the court may order any person to carry its decision into effect at the expense of the defaulting person or corporation.

Sanitary authorities may coöperate to construct sewerage works; one authority may expropriate land for its own needs, and pay in whole or in part for works constructed for its own and its neighbor's advantage, and within its own corporate jurisdiction.

In Germany, the only other European country which has attempted to deal systematically with this question of pollution of streams, no general laws as yet exist; but attempts made by different towns and cities to pour their sewage into neighboring streams have been hitherto defeated by the Imperial government, the minister of public works still having the duty laid upon him of deciding on the merits of each particular case. A commission composed of prominent scientists has, however, reported on the whole subject, and legislation is likely shortly to follow.

What the city of Berlin with over 2,000,000 of population has been able to do, illustrates the views which are held by sanitarians in Germany, and what the character of all legislation on this subject must necessarily be.

Turning to our own continent, we find that attempts in some instances of a comprehensive character have been made to deal with the subject of pollution of streams. The situation, however, at present seems to be, speaking generally, that in agricultural states little legislation on the subject has taken place; while in those with manufacturing interests largely developed, the competition of towns and the private interests of large manufacturing concerns have for an opposite reason prevented any effective legislation being passed.

So far as I have been able to gather, if we except four states or provinces, the most that has been done is to provide for the adoption of by-laws by municipalities, to prevent local nuisances.

In those states or provinces where state regulation of the pollution of streams exists, it is found amongst these that Massachusetts has approached the subject with her well-known thoroughness, and has given us a consolidated law, which is clear and fairly comprehensive. The first wise and broad provision is that no person shall pollute any water used for domestic purposes.

The state of Ohio has made a notable advance in the laws dealing with the subject, and while leaving power in the hands of individual municipalities to protect their own water supplies within ten miles from the point of intake, has also placed power in the hands of the state board of health, requiring that all proposed systems of public water supply and of sewerage shall be submitted to it for approval. The fines for infraction of the law, though heavy, have not that cumulative character which makes them in the English act so effective a deterrent.

By the legislation of 1895, the province of Ontario has placed upon its provincial board of health equally great powers without, however, making adequate provision for comprehensive preliminary investigations by an engineer attached to the board. The law in the other Canadian provinces is very similar to that of Ontario and will probably be found fairly effective for present needs.

From these illustrations it will be seen that a fair start has been made on this continent, whereby municipalities are brought in these matters under the operation of general statutory law; and we may, I think, safely leave the several state and provincial boards to work out in each case individual enactments based upon their several respective needs. The fact, however, that the larger streams are commonly state or international boundaries, and that they are those on which the larger cities and towns are situated, makes evident the fact that common views must be held as to needs, in order that concerted action be possible in the evolution of some such comprehensive scheme of coöperative work, as shall remedy the serious evils which prevail.

Either of two methods seems possible: First, an organization similar to that of the Sanitary Council of the Missisippi Valley, formed at the time of the great epidemic of yellow fever, which while not having, as I understand it, the power to enact laws, did practically make laws by each state board agreeing to carry out the resolutions agreed upon by the council. Second, national commissioners who would exercise jurisdiction over, first, all interstate waters of their respective countries, and second, by conjoint action over all international waters. Such commissioners would naturally be charged with the consideration of all schemes, which, having both commercial and sanitary phases, would demand the fullest investigations, in order that the interests of both should be considered to the greatest extent possible.

On such commissions would, naturally, be represented those officers of the several states specially charged with health matters, and who, under state laws, have more or less powers in municipalities under state or provincial jurisdiction. I illustrate the situation by a single case. The Niagara river is some thirty-two miles in length and has situated along it a population approximating 400,000. More than 300,000 of these are at Buffalo, which municipality at present illustrates in practice the fable of "The Wolf and the Lamb." At the annual meeting of the Ontario Association of Medical Health Officers, one of the most skilful experts of water analysis in Buffalo and a highly respected member of this association, presented a paper on the "Pollution of the Niagara River." The paper was a remarkably clever and ingenious one, gravely concluding with the opinion that on a continent where city building is going on with such rapidity, the pollution of even great volumes of water becomes inevitable, and that therefore methods for artificially sterilizing and purifying public water supplies (perhaps excepting Buffalo with our Lake Erie to draw from) must inevitably be the only remedy in the near future. Now were it possible to have the problem presented by the Niagara river investigated and discussed in its several bearings by an international or interstate commission, it would, I believe, be found quite possible for the present and future needs of the several municipalities in the matter of pure water, to be adequately dealt with by coöperation, and that an apportionment of the cost of a common supply of uncontaminated lake water for all the municipalities along the river could easily be arrived at.

With the needs of such conservancy boards to deal with our international streams so apparent, I would urge the appointment by this association of a special committee to consider this question with a view to reporting upon the best means for giving practical shape to the views contained in this paper.

TABLE I.

Population of certain States situate on Lakes, for the years 1870, 1880, and 1890, with per cent. of increase for the two periods.

<table>
<tr><th>STATE.</th><th>POPULATION.</th><th>POPULATION.</th><th>POPULATION.</th></tr>
<tr><td>Wisconsin</td><td>1870
1,054,670</td><td>1880
1,315,497</td><td>1890
1,868,880</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 24.73 per cent.
Per cent. of increase 1880 to 1890, 28.23 per cent.</td></tr>
<tr><td>Minnesota</td><td>1870
439,706</td><td>1880
780,773</td><td>1890
1,301,826</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 77.57 per cent.
Per cent. of increase 1880 to 1890, 66.74 per cent.</td></tr>
<tr><td>Michigan</td><td>1870
1,184,059</td><td>1880
1,636,937</td><td>1890
2,093,889</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 38.25 per cent.
Per cent. of increase 1880 to 1890, 27.92 per cent.</td></tr>
<tr><td>Ohio</td><td>1870
2,665,260</td><td>1880
3,198,062</td><td>1890
3,672,316</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 19.99 per cent.
Per cent. of increase 1880 to 1890, 14.83 per cent.</td></tr>
<tr><td>Pennsylvania</td><td>1870
3,521,951</td><td>1880
4,282,891</td><td>1890
5,258,014</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 21.61 per cent.
Per cent. of increase 1880 to 1890, 22.77 per cent.</td></tr>
<tr><td>New York</td><td>1870
4,382,759</td><td>1880
5,082,871</td><td>1890
5,997,853</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 15.97 per cent.
Per cent. of increase 1880 to 1890, 18.00 per cent.</td></tr>
<tr><td>Illinois</td><td>1870
2,539,891</td><td>1880
3,077,871</td><td>1890
3,826,351</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 21.18 per cent.
Per cent. of increase 1880 to 1890, 24.32 per cent.</td></tr>
<tr><td>Indiana</td><td>1870
1,680,637</td><td>1880
1,978,301</td><td>1890
2,192,404</td></tr>
<tr><td colspan="4">Per cent. of increase 1870 to 1880, 17.71 per cent.
Per cent. of increase 1880 to 1890, 10.82 per cent.</td></tr>
</table>

Population of Cities and Towns in United States on Great Lakes.

STATE OF WISCONSIN.

	1870	1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr. ct. increase.
Kenosha	4,309	5,039	16.84 per cent.	6,532	29.63 per cent.
Racine........	9,880	16,031	62.25 "	21,014	31.08 "
Milwaukee	71,444	115,587	61.78 "	204,468	76.90 "
PortWash'ngt'n	2,390	2,604	8.95 "	1,659	....
Manitowac	5,168	6,367	23.20 "	7,710	21.09 "
Kewannee.....	....	1,050	....	1,216	15.81 "
Sheboygan	5,310	7,314	37.73 "	16,359	123.67 "
Sturgeon Bay..	....	2,049	....	2,194	7.07 "
Two Rivers....	1,365	2,052	50.33 "	2,870	39.86 "
Total	99,866	158,093	37.29 pr ct. ave.	264,022	43.14 pr ct. ave.

STATE OF MINNESOTA.

Duluth........	3,131	838	....	33,115	3,851.67 per ct.

STATE OF MICHIGAN.

Grand Haven..	3,147	4,862	54.49 per cent.	5,023	3.31 per cent.
Muskegon.....	6,002	11,262	87.63 "	22,703	101.59 "
Ludington.....	....	4,190	....	7,577	80.36 "
Manistee......	3,343	6,930	107.29 "	12,812	84.88 "
Alphena.......	....	6,153	....	11,283	83.37 "
Bay City......	7,064	20,693	192.94 "	27,839	34.53 "
Monroe.......	5,086	4,930	....	5,258	6.65 "
Buchanan......	1,702	1,894	11.28 "	1,994	5.29 "
St. Joseph.....	....	2,603	....	3,733	43.41 "
South Haven..	1,576	1,442	....	1,924	33.42 "
Mount Clemens	1,768	3,057	72.91 "	4,748	55.31 "
Sault St. Marie	....	1,947	....	5,760	195.84 "
Benton Harbor.	661	1,230	86.08 "	3,692	200.16 "
Sand Beach....	....	534	....	1,043	95.31 "
Total......	30,349	71,727	87.51 pr ct. ave.	115,389	73.10 pr ct. ave.

STATE OF OHIO.

Ashtabula.....	1,999	4,445	122.36 per cent.	8,338	87.58 per cent.
Sandusky	13,000	15,838	21.83 "	18,471	10.31 "
Cleveland......	92,829	160,146	72.52 "	261,358	63.20 "
Toledo.........	31,584	50,137	58.74 "	81,434	62.42 "
Amherst Vill'ge	....	1,542	....	1,916	24.25 "
Painesville.....	3,728	3,841	3.03 "	4,755	23.79 "
Geneva........	1,090	1,903	74.59 "	2,194	15.29 "
Total......	144,230	237,852	58.84 pr ct. ave.	378,466	40.97 pr ct. ave.

STATE OF PENNSYLVANIA.

Erie City......	19,646	27,737	41.18 per cent.	40,634	46.50 per cent.

STATE OF NEW YORK.

Rochester.....	62,386	89,366	43.25 per cent.	144,834	49.83 per cent.
Oswego.......	20,910	21,116	.98 "	21.969	3.88 "
Dunkirk......	....	7,248	....	10,046	38.60 "
Watertown....	9,366	10,697	14.72 "	16,952	58.47 "
Total.....	92,662	128,427	19.65 pr ct. ave.	193,801	37.69 pr ct. ave.

STATE OF ILLINOIS.

Chicago.......	298,977	503,185	68.30 per cent.	1,099,850	118.58 per cent.

STATE OF INDIANA.

Michigan City..	3,985	7,366	84.84 per cent.	10,776	46.29 per cent.

TABLE II.

Cities and Towns on International Rivers.

STATE OF MICHIGAN.—ON RIVERS.

1870		1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr ct. increase.
Fort Gratiot...	....	1,280	....	2,832	121.25 per cent.
Port Huron....	5,973	8,883	48.72 per cent.	13,543	52.46 "
Detroit........	79,577	116,340	46.20 "	205,876	76.96 "
Total......	85,550	126,503	47.46 pr ct. ave.	222,251	83.55 pr ct. ave.

STATE OF NEW YORK.—ON RIVERS.

Buffalo........	117,714	155,134	31.79 per cent.	278,796	64.80 per cent.
Niagara Falls..	3,006	3,320	10.44 "	5,502	65.72 "
SuspensionB'dg	....	2,476	....	4,405	77.91 "
Lewiston......	770	680	....	633	....
Tonawanda....	3,039	4,909	61.53 "	7,145	45.55 "
Total......	124,529	166,519	34.48 pr ct. ave.	296,471	63.49 pr ct. ave.

TABLE III.

Cities and Towns in Ontario on International Rivers.

	1870	1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr. ct. increase.
Sarnia	2,929	3,874	32.26 per cent.	6,692	72.74 per cent.
Chatham	5,873	7,873	34.05 "	9,052	14.97 "
Windsor	4,253	6,561	54.26 "	10,322	57.47 "
Sandwich	1,160	1,143	....	1,352	18.28 "
Fort Erie	835	722	....	934	29.36 "
Amberstburg	1,936	2,672	38.02 "	2,279	....
Total	16,986	22,845	39.64 pr ct. ave.	30,631	38.56 pr ct. ave.

TABLE IV.

Towns and Cities on Red River in United States.

STATE OF MINNESOTA.

	1880	1890	
Name.	Population.	Population.	Per cent. of increase.
Breckenridge	....	655	....
Caledonia	894	927	3.69 per cent.
Total	894	1,582	3.69 per cent.

NORTH DAKOTA.

Pembina	287	670	133.45 per cent.
Grand Forks	1,705	4,979	192.00 "
Fargo	2,693	5,664	110.32 "
Total	4,685	11,313	144.96 pr ct. ave. increase.

Towns and Cities on Red River in Manitoba.

Winnipeg	7,985	25,639	221.09 per cent.
Selkirk	....	950	....
St. Norbett	....	960	....
St. Boniface	1,283	1,553	21.04 per cent.
Total	9,268	29,102	121.06 pr ct. ave. increase.

DISCUSSION ON THE PAPERS OF DRS. HARTZELL AND BRYCE.

Dr. Ernest Wende of Buffalo.—I wish simply to make a correction. The Association, I judge, from the remarks Dr. Bryce made, might think Buffalo dumped her garbage into the Niagara river. That is not the case. Buffalo cremates her garbage. The difficulty that arose between the Canadian government and some of the garbage contractors of Buffalo was because they dumped earth into the river. It was not refuse. This was dumped below the inlet of the Buffalo water supply. I approve of the action of the Canadian government, but I simply want to state that Buffalo does not dump its garbage into the river, but cremates it.

Dr. A. W. Cantwell, of Davenport, Ia.—Living on the Mississippi river and being a member of this Association for many years, I do not think I have ever heard two papers more valuable than those which have been presented this morning. Go where we will in this country, we will find more or less pollution of our streams, and this is a subject that will come before us from time to time and we must deal with it. I do not know of any better way to approach this subject than from the standpoint of trying to secure national legislation for the purification of our rivers and streams. In my city we use the river more or less as a sewer, and we dump into it from ten to twenty tons of garbage every day. It costs but little to do this. To cremate the garbage would cost us something, and that is one reason why we dump it into the river. I believe reference was made to the pollution of the Mississippi river in the last forty years, showing that forty years ago from St. Louis up there were only a few thousand people, but the population of the cities along this river has increased to a surprising extent, so that the river is now being polluted more or less by nearly a million and a half of people. What will it be in future years unless something is done? This Association will have to stop the pollution of streams, and sewage from going into the rivers, by legislation. I hope the Association will see fit to appoint a committee in order that something may be done.

Dr. E. A. Guilbert, of Dubuque, Ia.—I have been deeply interested in these papers, particularly in the one of Dr. Hartzell of Ohio. I deeply appreciate the importance of action on the part of this Association. Of course, it will be entirely tentative, but it will have its effect. The gentlemen here seem to forget that this matter is already before congress. Last winter a congressman from Indiana, whose name I regret to say I cannot recall at this moment, introduced a short but exceedingly concise and expressive bill in the house of representatives, which is now in the hands of a committee. It was introduced late in the session. Our state board of health, at its quarterly meeting in February, had this matter before them, and, feeling the necessity of action on our part, as well as on the part of other state boards, we introduced and passed a series of resolutions commending the bill, and ordered them transmitted to our representatives and senators in congress, who were importuned to give the bill all the aid they possibly could. Some of these men have been heard from. Some of our representatives there are men of calibre, who have considerable back-bone; men who understand this matter thoroughly and have the courage of their convictions. I have conversed with several of them, and I think at the next session of congress something may be done in that respect, unless the near approach of the presidential election shall so absorb all efforts that everything else will go by default. It is highly important that this Association should take not only formal, but positive, action in this matter, and endeavor to influence our representatives in Washington to see whether some legislation cannot be effected which will stop the pollution of our streams. It cannot be done by state legislation alone. This bill requires the appointment, as I understand it, of a Mississippi river commission, and this commission is to have power to determine what shall be done with reference to prohibiting the pollution of water supplies and to recommend to congress such action as is necessary. And they are endowed to a certain extent with judicial power. I do not recall the essential features of the bill at this time.

Dr. P. H. Bailhache, of New York.—I desire to inquire whether the bill referred to passed. If not, a bill pending before the last congress is dead, and, if we desire to accomplish anything in the way of legislation, it will be necessary to re-introduce that or a similar bill in order to have action taken. Any bill that was before the last congress will never come up again unless it is re-introduced.

Dr. Guilbert.—My understanding is that the bill is still in the hands of the committee, but has not been reported on.

Dr. James Patterson, of Winnipeg.—I desire to express my approval of the papers read. I think the only way to dispose of the matter to which Dr. Bryce refers is by the appointment of an international commission. The Canadian government will have to take part in it the same as the United States government. I wish to refer to one river that has not been touched upon, namely the Red river running to the north. It runs through to Minnesota, or is the dividing line between Minnesota and Dakota, the principal source of water supply we have in these two states; and it is polluted to a serious extent by the sewage, garbage, and refuse from the towns and cities in the states of Dakota, Minnesota, and the north. I hope that if a committee is appointed to take this matter into consideration it will not forget the condition of the Red river to the north.

Dr. Joseph J. Kinyoun, of Washington, D. C.—I heartily endorse the papers presented this morning on the subject of pollution of our water supplies. There are about twenty-five million people directly affected by the pollution of the rivers of the United States. It has become one of the greatest and most serious questions with which we have to deal. It is far more important to us than cholera, yellow fever, small-pox, or plague. Congress has been importuned several times during the past to take some action with regard to the local effect of these infectious diseases, which we are supposed always to get largely from foreign shores, and during the last congress, through committees of both houses, an emergency fund of $687,000 was set aside to be used only in the presence of a direful epidemic. Now, it seems to me a part of this fund could be used for the investigation of such questions as are now occupying our attention, among which is the question of the pollution of water supplies. Mr. Barthold, a member of the inter-state committee of the house, who is probably as much interested in the subject of the great drainage canal as any one, had several conferences with the Marine Hospital Bureau with regard to the proper action to be taken. He is thoroughly in sympathy with the appointing of a commission to carry out this work, and he feels that there are more concerned in the matter than those residing along the banks of the Mississippi river. The subject should be thoroughly investigated and taken up along the broadest lines possible with the effort of bringing about the greatest good. It is my belief that some such commission, acting under the central governmental authority, should be appointed, and the men composing that commission should be selected by reason of their peculiar fitness for such work, and that the investigation should be undertaken on governmental or provincial lines. The subject of pollution of water supplies of the United States is unique and stands alone. The conditions we have here are entirely different from those that exist in other countries, and, we could not, even by the most careful scrutiny and study of those conditions that exist in Europe, draw an apt lesson therefrom. It is my belief that a commission should be appointed of sufficient size, not too large, which shall comprise the best men of the country; give them ample funds to meet all requirements, and not be contented until they are able to present to the American people a comprehensive report on the pollution of water supplies, the best methods for the prevention of the same, and make such suggestions to individual states that they can take intelligent action and bring about a better condition of our health than now exists. As years go along, the question becomes more and more important, and the sooner such action is taken, the better it will be for the general public.

DR. FELIX FORMENTO, of New Orleans.—I am sure I voice the sentiments of the members of our Association, when I say that we have all listened with great satisfaction to the reading of the papers on this very important subject, the pollution of streams. It is a subject of as great importance as any which occupies our interest and attention. We all agree as to the necessity of doing something. We are all interested as sanitarians with reference to the manner in which our water supplies shall be purified. I represent that part of the country situated at the lower end of the Mississippi. I sometimes wonder whether the pollution of the streams of the upper Mississippi and Missouri rivers can have any influence upon the pollution of our river in New Orleans. To think so, it would be necessary to believe in homeopathic dilution. I do not think that at such a distance a river can be polluted to any extent. But we are to look upon this problem from a general sanitary point of view. Something must be done. The gentlemen have spoken of the conditions as they exist, and recommend that some action emanate from this society which represents the sanitary officers and sanitarians of the whole country, and transmit the same to congress, recommending that such an international commission be appointed as has been spoken of. Although in favor of bringing about such measures, I was very much afraid it might not amount to anything. These Platonic recommendations are not looked upon with the careful consideration they deserve, and some action should be taken now to remove the evils which have been pointed out so vividly by the first speaker. The Chicago drainage canal, which is being dug at the present time, would require some action at this moment, in order to prevent the wholesale pollution of the Mississippi river by this canal. Something must be done. What is to be done? I am not prepared to say. I would like to discuss the necessity as to what is to be done, so that we can accomplish more than a mere expression of opinion. The latter does not amount to anything, unless we devise some practical means of stopping the nuisance which is going on from day to day, and which is not limited to the Mississippi river, but to the whole country. Streams are being polluted by garbage everywhere or by refuse, etc. We need remedies for these evils. Can we apply them, or will they be enforced? Cremation is one; purification of sewage, such as is practised in European cities, is another. The committee that is appointed to study this question should come before us with a practical plan, by means of which we will be able to accomplish something beyond the simple expression of opinion.

Dr. R. H. Lewis, of Raleigh, N. C.—After listening to the remarks of the preceding speaker, in reference to this matter of pollution of water supplies, it occurs to me that we have in view the protection of the water supply for other cities below the river referred to. There are several cities and states involved, and we must, therefore, if possible, concentrate some influence in order to offset any opposition that may be raised from any particular city or state. So it occurred to me that perhaps it would be well for a committee to take the matter in hand to secure legislation from congress, and in the appointment of this committee it should be composed of representative members of the different state boards of health on the rivers that are involved. Personally, our state is not interested in this. The health officers are united, it seems to me, and I think it is the best method we can adopt, in order to influence congress to take the necessary action.

Dr. J. N. McCormack, of Bowling Green, Ky.—In accordance with the suggestions of Dr. Bryce, I move that a committee of three (with Dr. Bryce as chairman) be appointed to bring this matter in more suitable form before the Association. Seconded.

The President.—I am inclined to think that this resolution should go before the executive committee, but the Association can vote on it if they so desire. (The president put the motion, which was carried).

Dr. E. P. Cook, of Mendoto, Illinois.—I ask your indulgence for a few moments. I rise with some degree of reluctance to speak in the presence of such a distinguished body of sanitarians, but entertaining some views out of harmony with the prevailing sentiment of the Association, I will take this position: We all understand that the water courses and the sources of water supplies of humanity have long been considered sacred, and at this latter day there is no subject more worthy of our consideration than the water supply of these growing communities, scattered all over our country and that of our neighbors contiguous. Unquestionably Nature intended that these water courses should be for the conveyance of the storm water, although the time has come when man's necessities have compelled him to use that water supply for his good. To-day I think we are reaching the stage in which the great thought should be purity of water for domestic purposes and absolutely clean water for drinking purposes. It seems to me, it is utterly impossible, and will increasingly become more difficult to secure pure water for domestic and drinking purposes without the adoption of methods of filtration, and perhaps sterilization afterward. The office of these great water courses is to meet a commercial necessity. It is a business one. And let me say further, it occurs to me that this great Mississippi is to be the future *cloaca maxima* of the Mississippi Valley, and that other streams intersecting it will be more or less affected. My home is in the interior of Illinois, a city in which the population is rapidly increasing, in one of the agricultural districts, with five thousand inhabitants. The question before us to-day is, what disposition shall we make of our garbage and sewage? It is no longer a question as to the necessity of cremation everywhere to dispose of garbage and rubbish. Let that be settled. As to sewage, however, we meet a difficult question. Contamination is inevitable if it is conducted into these streams. Sooner or later there will be danger possibly at the outlet of the Mississippi at New Orleans; but, as Dr. Formento has said, the stream may be so diluted or rid of pollution that it is harmless. But it occurs to me that the financial question will come into consideration after a while, and that we can more inexpensively and successfully dispose of our sewage by conducting it into these water courses and seek our water supply for domestic and drinking purposes from other sources. Chicago has been menaced with contamination of water supply because of what she is, and she will be able to seek her water supply from other sources. The water may be conducted by means of filtration beds, may be sterilized and rendered innocuous at not great expense; but the excreta, great waste, must be disposed of near the city of Chicago. It must be conducted by our water courses to the sea. Her nearest course is through her drainage canal, the Illinois and the Mississippi rivers.

I certainly should not have asked your indulgence in presenting these views, out of harmony with those entertained by most of the members of this Association, if I did not believe there was a growing sentiment that we will ultimately establish in this western portion of our country and in the great Mississippi Valley means whereby this matter of the pollution of our streams will be considered from that standpoint. Our friends upon the lakes should be under great obligations to the city of Chicago and state of Illinois if she will conduct her sewage in a different direction.

MR. RUDOLPH HERING, of New York city.—As a civil engineer, I would like to make a few statements on the subject under discussion. In the first place, I would say I am fully in sympathy with the sentiments contained in the two papers with regard to bringing about purity of our water supplies, and no one can be more in sympathy with such a movement than a civil engineer who is called upon to provide water supplies. I also wish to state how much in sympathy the profession of civil engineers would be with any movement on the part of this Association to have some national legislation effected on the subject of pollution of rivers. We all know what a tremendous effort was necessary to accomplish it in England, how it failed in Germany at first, but they are accomplishing in Germany now by efficient legislation a good deal, but not as much as they sought for at first. The question is a very important and serious one, and the engineer, you might say, is practically the doctor in such cases. He is called upon by the cities to help to advise what to do in order to get the best water and to prevent sewage pollution, and usually he has finally to deal with the subject. I am sorry to say that I cannot fully endorse all the sentiments contained in the two papers, particularly in the first one, because some of them are impracticable. There are two questions which it is necessary for us to consider. The first is the sanitary one, and the second, the financial one, and it is just as important, so far as practical results are concerned. Take a poor person suffering with consumption in the East. If he wants relief, he is told by a physician to go to Colorado or some other place where he is likely to entirely get rid of his disease, or he is relieved for many years. The patient says, "I cannot do it; I have not the money." You have to do the best thing you can without money. And that is the question the engineer has to face. He is placed in the same condition as the patient. People cannot pay for a complete purification of sewage, or cannot pay for complete purification of their drinking water, and the question is, what can you recommend us to do, so that we can get water that is better than we have now? The engineer wants to give the people as pure water as possible. He wants to make sewage innocuous, or to destroy it. But he cannot do it because no one has the money to pay for it. As chief engineer of the Chicago Commission and the one who recommended the plan against which so much has been said to-day, I would like to say a few words. The question is not nearly so bad as it has been represented here this morning. I was engaged for eighteen months with others in close study as to what Chicago should do to maintain purity of water supply and to get rid of sewage, as the city wanted provision made for two million and a half of population. Everything that we could possibly find in Europe and America was discussed; experiences were collected and carefully weighed; the best methods of purification considered, and estimates of cost were made and carefully examined as to how to purify sewage in the manner recently brought to our notice by the Massachusetts State Board of Health, and it was found that Chicago would have to pay sixty-five millions of dollars to accomplish purification of its sewage in that manner. Another method was carefully examined, and that is the precipitation by chemical means. I have no doubt that most of you saw the splendid manner in which this method of disposing of sewage was demonstrated at the World's Fair, and is now practised in Massachusetts and in other places in this country, as well as a large number of places in England. This method would cost Chicago nearly seventy millions of dollars, and the results would not be so satisfactory as many would suppose. For instance, careful examinations in Chicago at the World's Fair by that process, carried on under the very careful personal supervision of Mr. Hazen, a member of this Association, showed that it was not possible to remove more than about one half of the organic matter from the sewage, the rest went into the lake. You cannot, under any circumstances, in this country precipitate by chemical means sewage for less than perhaps thirty cents for every man, woman, and child per annum. See what that amounts to for a city! Where is its practicability? The engineers are compelled to put sewage into rivers as long as it is not objected to and does not do harm, and it must be done until we have more money to do something better with it.

In regard to the Chicago drainage canal, I wish to say a word or two more. It was necessary, because it amounted to so much money, to find out how large a canal should be made to carry the water which was properly diluted. Calculations were therefore made and investigations carried on in this country and in Europe, and it was found that if we diluted the sewage of one thousand people with two hundred and fifty cubic feet of water, taking up sewage every minute of time, we would get conditions which would not be objectionable to anybody. The information was obtained in this way: Take the river Oder. It was there that a portion of the river was examined which showed very little pollution from the city of Breslau; it was found how much water flowed and how many people discharged sewage into it. The same thing was done with the river Elbe, and with three or four other rivers in English towns, and also in our own country. Let us take the Des Plaines river of Illinois, into which the sewage of Chicago is now poured. We find that the people of the city of Peoria and its vicinity until a few years ago used the water for drinking purposes. It was not objectionable to the people living alongside of it. It is not to be expected that with a river anything like the present Chicago river, the people will use the water for drinking purposes. The water supply for drinking purposes should be filtered and made absolutely pure. Personally, I am in favor of that and all engineers are coming to it

Europe has already taken that view. In England and Germany, all water supplies from rivers, even though not polluted, must be filtered for drinking purposes. Take the water in Switzerland. There are beautiful lakes there containing no sewage, and yet the water is filtered in an excellent way before it is used for supply purposes. We must strive to get pure water supplies obtained by filtration or other purification methods. Our large rivers can be used for such pollution which it is impracticable to keep out, and which should not be sufficient to make the stream offensive. A great deal of wash water must necessarily go into these rivers and you cannot purify the streams; but we should, at all hazards, purify our water supplies for consumption. Let the general dust and refuse, which cannot be kept out, go into the large rivers, provided it does not cause a nuisance. Garbage should never be thrown into streams that can reasonably be kept out, and it is to be expected that cities in the future will pay enough to keep it out of every stream.

Dr. C. O. Probst, Columbus, Ohio.—It has been suggested by the previous speakers that the committee to be appointed should bring the matter of pollution of our water supplies before our national governments with a view to securing legislation, and possible appropriations, for carrying on such work as would have to be done. It is to be doubted whether we are prepared to carry the matter this far at the present time. While we may be educated as to the extent of such pollution, and as to the evils arising from the use of such water supplies, the general public is not. A great deal of information in regard to such matters has already been gained in individual states, and I would suggest that this committee should endeavor to collect this and place it before the people. Any commission created by congress should also have the collection of information in regard to water-borne diseases made a prominent feature of its work. Let the people once be thoroughly convinced that the pollution of our rivers is causing hundreds and thousands of deaths, as is claimed by sanitary authorities, and they will be willing to bear the expense of properly caring for the sewage, garbage, and other filthy substances poured into them.

The farmers in Ohio are just learning that they have a right to the streams in their natural state of purity, and that the courts will sustain these rights. Several of our cities have recently been compelled to purify their sewage to escape damage suits for the pollution of streams. The people throughout our respective countries should be impressed with the idea that their united demand would enable a stop to be put to the abominable practice of turning our rivers into sewers. We should all work together in this important matter to secure the legislation we so much desire.

Dr. Bryce (closing the discussion).—We all fully recognize the position taken by Mr. Hering. I think his remarks illustrate exactly the absolute necessity for a commission of this kind, when he stated that he with many other prominent civil engineers in this country was engaged for eighteen months in discussing the important matter of what should be done to best relieve one city of its own sewage. Now, if it took Mr. Hering and others this length of time to settle the question for this one city, it would seem only natural that a commission should be appointed with proper powers to consider this subject in all its aspects. The position seems to be made clear that we must have a committee appointed to consider this matter seriously, not for the benefit of one particular community, but for the salvation of all cities whose water supplies are being constantly polluted.

The other points that have been made are in the direction of the views expressed in the two papers, and a resolution has been unanimously passed that a committee be appointed to draw up resolutions or make a report, and I would suggest that when that committee is named by the president, a gentleman so well known as Mr. Hering should be appointed on it, so that his views and those of engineers shall receive proper consideration.

NOTES ON THE SOIL FACTOR IN THE DEVELOPMENT AND PREVENTION OF INFECTIOUS DISEASES.[1]

BY EDWARD PLAYTER, M. D., OTTAWA, CANADA.

In England, the health authorities in abolishing the quarantines practically recognize, in a measure, at least, the principle this paper is designed to advocate: that, namely, of taking into practical consideration in preventive medicine in a much greater measure than we do at present that important and essential factor in the development, growth, and spread of infectious diseases, which has been aptly termed soil;—the good soil, for that infecting seed which does not fall by the wayside nor upon rock. It is true that even in England the principle is not acted upon to that extent —that personal or individual extent—which it seems possible for us as sanitarians to attain. The importance in the development of specific disease, and of epidemics thereof, of the factor soil, is being gradually more and more recognized; but in all our efforts to prevent disease, it is yet kept quite in the background. True, in pamphlets distributed for preventing the spread of diphtheria, for example, the public are advised not to neglect a "sore throat," and in cholera pamphlets a few lines of instruction are added respecting the diet and general habits of life. Nevertheless, almost the whole of the instructions, like our preventive measures, bear on the destruction of the seed—the infection. The infection appears to be regarded as, and so the people are taught that it is, the one, the first and only cause of the disease which it is our object to prevent. Now are the specific germs the first or most important cause? Are they the immediate, exciting cause? If it be true, as now seems probable, if not almost certain, that the cholera bacilli or vibrios will not live or develop in a clean, healthy digestive canal; if it be true, as seems more than possible, that typhoid fever will not spring up in a clean, healthy intestine—one not in a condition like unto a well-filled heated privy vault which may transform the benign bacillus coli communis into a virulent pathogenic parasite; if the diphtheria bacillus will not infect a sound, healthy throat, and it is said it will not grow when implanted on the sound mucous membrane of a susceptible animal; and if the tubercle bacillus will not take root except in specially prepared soil—probably, as I hope to be able to show more clearly before many months, a soil specially prepared by defective respiration, then, are not the so-termed "predisposing" conditions of the body—of the intestinal canal, of the throat, and of the tissues invaded and colonized by the bacillus tuberculosis, respectively, in the diseases above named, with probably in all cases weakened phagocytes, or power of resistance against the invading infections, then are not these conditions, rather than the disease germs, the immediate, exciting causes of the respective diseases?

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[1] Presented at the Denver meeting.

The germs of typhoid fever, diphtheria, and consumption are ubiquitous in most countries, countless billions of them being cast off daily by the diseased. With the majority of persons they are harmless. Those persons therefore who furnish the soil for the growth of the germs, and so for the development and spread of the diseases, furnish there and then the immediate, exciting cause of them, the most important of the two chief causes in all infectious diseases.

It appears to be becoming clearer and clearer that some of the so-called pathogenic organisms are first, if not always, saprophytic;—simply scavengers, in accordance with nature's universal law, as well exemplified in the common house fly which frequents, with numerous companions, the kitchen in and about which there is exposed decomposing refuse. It is not probable, not in accordance with nature, that these microscopic organisms were ever designed for the destruction of man. By his uncleanliness, man transforms them or their products into virulent poisons; a process, explainable on principles familiar to the cultivators of plants.

Eighteen years ago, Dr. Alfred Carpenter, the eminent English sanitarian, laid down the following rational hypothesis, respecting the development of infectious diseases.[1] He first remarked: I much doubt if these living organisms, the disease germs, could have any effect upon the body *if the recipient were perfectly healthy; if no impurity existed in the fluids of the body;* if the blood contained nothing foreign to a healthy and natural state. If this be so, he continues, a question arises, as from whence these impurities proceed, and how their effects are to be guarded against. I venture to put forth an hypothesis for consideration, which will explain much which is difficult to understand on any other view. Some impurities must exist; they are the used-up matter, the result of the act of life, or they may be inherited tendencies, which have resulted from former neglect of sanitary law, and which have depreciated the quality of the stock, and rendered it more susceptible to bad influences. The impurities naturally increase if there are any defects in the sanitary arrangement of the individual corpus. Their presence is of no moment if they are not in excess, and if they are removed from the body as fast as they are formed, or in the course which they naturally follow. Let us represent them by X, in an equation in which the factors X, Y, Z, (as a total) represent any form of epidemic disease. The problem is to assess the value of each factor in the equation. Divide the factors into two parts—centric elements, or those which are proper to the body; and eccentric, or those which act upon it from without; X, Y, Z, may equal zymotic disease of any kind. Let $X = U$ and E; U being the used-up material, the formed material of Beale, always in the act of formation, is not foreign matter, and is not in ordinary proportions injurious to life. It is always being diminished as fast as it is formed, by one or other of the excretory organs which exist for the purpose of removing it. If all the excretory organs, and all functions are healthy, and all doing their work properly, the body is in good health, there is no excess of used-up material, no *debris* of combustion. If, however, one or other of the excretory organs fails to do its duty, from either overwork or inertness, something is left in the humoral system, and E is added. It becomes a positive quantity and represents the excess of matter which should have been removed, *i. e.*, $U+E=X$. They have a common origin, being the *debris* of the act of living; E the excess of waste in the body will differ in quantity as well as in quality. It will be modified by personal character, by actions, by non-actions, and even by attainments, but especially by attention to, or neglect of, sanitary and moral laws. If E is absent, X is not complete, and X, Y, Z, cannot arise; X even may be complete from the circumstance I have detailed, but Y, Z, are still required to establish an epidemic. If Z is made to correspond to a germ, or living organism, the particulate contagium of any kind of zymotic disease, the multiplying focus of infectious disorder, and one of the eccentric elements in the equation, it has to be introduced from without, and is capable of modification according to the character of the soil into which it may happen to be transplanted. Like the *Penicillum glaucum*, upon which alcoholic fermentation depends, and without which alcohol is not produced, if Z does not gain admission to some part of the humoral system, the entity, zymotic disease cannot arise. Just as *Penicillum glaucum* requires the sugar and the temperature to produce alcohol, so Z, the contagium-particle, requires the food, upon which it increases and multiplies, as well as certain meteorological states, for its proper development. These latter conditions are represented by Y. The severity of the disease will depend upon the quantity of E, the excess of waste which exists in the factor X. The epidemic will be more or less general and fatal according to the quantity of E in each individual, not according to the character.

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[1] Canadian Health Journ Sept. 1876—Vol. II, p. 278.

Carpenter's theory is in exact accord with my own experience and observation. Who are they who most readily "take" infectious diseases? Not the clean skinned, and clean blooded. There is doubtless a great deal yet to be learned, respecting the chemical and physiological changes, which take place in any excess of waste material in the body, what ptomaines, enzymes, or tonic compounds may be thereby formed, and what relations these bear to certain saprophytic microbes, or pathogenic germs. The late Sir Andrew Clark, some years ago, drew attention to the effect, in the production of ænema, of certain poisons arising from the retention of fecal matter in the intestines, as in constipation; and it seems probable that the absorption of certain ptomaines from the same source, gives rise to certain so-called "malarial" affections. In some of these ptomaines formed from excess of waste substances in the body it is possible there may yet be formed essential conditions, special essential compounds, for the life and growth in the body of the specific germs of infectious diseases, when these have gained an entrance into the body; and possibly for the development of pathogenic, or disease, germs from benign organisms. The bacillus coli communis is naturally doubtless a benign organism. Yet it has long been suspected that it may be transformed in some way into the bacillus of true typhoid fever. At the annual meeting last month of the British Medical association, this subject was again discussed. Mr. H. R. Kenwood, M. D., of London, in a paper on. the "Origin and spread of typhoid fever," said: "Evidence was adduced in support of the view that typhoid fever might spring from acute diarrhœa. . . . Was Ebertt's bacillus the *vera causa?* If so, were we justified in assuming that it could proceed from an evolution of the bacillus coli communis? There was evidence that even greater changes than were represented by the slight differences between the Eberth Gaffky bacillus, and the bacillus coli communis, both functional and morphological, might be artificially induced in bacteria. . . . Clinical evidence all pointed to the closest relationship between typhoid acute summer diarrhœa." Epidemiological evidence also, Mr. Kenwood contends pointed this way. Mild unrecognized types—diarrhœa, ambulatory typhoid—"frequently accounted for the origin and spread of typical typhoid fever."

If the bacillus coli communis may be transformed in the body, as, probably, by a foul condition of the intestine and some toxic substance evolved therefrom, into the bacillus typhosus, then we have a clear explanation of the occasional, if not frequent, so called *de novo* origin of typhoid fever, concerning which there has been a difference of opinion, and no little controversy, during the last quarter of a century, many of our most noted scientists contending that it may and does arise in this way.

However all this may be, we have already learned enough, about which there is no question, for a basis for safe work in the direction indicated herein,—that of giving in our preventive efforts much more attention than heretofore to the soil factor.

Respecting the prevention of consumption, for example, before we shall succeed in greatly reducing the mortality from this disease, much will have to be done besides the destruction of the tubercle bacillus, toward which nearly all preventive effort is now directed. Moreover, if as Dr. Prudden of New York estimates, there are over twenty millions of these bacilli cast off daily in the sputa of a consumptive patient with an average amount of expectoration, the destruction of the totals to even a much less harmful extent, from thousands of patients abroad, will be no easy task. Some one has said: "Killing tubercle bacilli seems a futile occupation. Though hundreds of bacilli were destroyed every day, countless millions would survive. If the entire human race should unite to exterminate them, it is doubtful whether it would succeed. In view of this it might seem to some persons wiser to attack the soil formation first."

2. Overalls and head covering should be supplied; of such a color as to show the bronze. These should be washed at least once a week.

3. All persons desiring respirators should be supplied. These should be washable and changed not less than three times a week.

4. A place should be provided for the workers in which to change and leave their clothes.

5. No food should be eaten by any one in the room where bronzing or "dusting off" has been carried on during the day.

6. Extreme cleanliness is urged; also the provision of lavatories and bath-rooms supplied with hot and cold water, soap, towels, and nail brushes.

7. Printing in size to be performed in a separate room from the bronzing and "dusting off" room.

8. Milk to be supplied twice a day to the workers, and the milk to be supplied as milk, and not its price in money.

9. All persons employed, to be examined once a month by a surgeon, who should have power to order temporary or total suspension of work.

10. A register to be kept, containing the date and result of his visit and his requirements.

11. All cases of illness attributable to bronze-working to be reported to the District Factory Inspector.

PAPER STAINING, COLORING, AND ENAMELING.

The committee calls attention to the early investigations upon these occupations and the fact that great improvement has followed the report of 1880, before which wall papers were found to contain as much as 59 per cent. of arsenite of copper. At the present time, the poisonous colors are found to be almost entirely substituted by harmless colors, and arsenical poisoning from this source has become extremely rare. Still, the committee found certain conditions and processes which called for reform.

The chief dangers in this industry appeared to be due to those arising from intense heat in the work-rooms, bad ventilation, and the danger incident to dusty processes—especially those of bronzing, "dusting off," flocking, mica-dusting, and the processes entailed in satin work.

For the prevention of these dangers, the committee made recommendations nearly identical with those which applied to the workers in bronzing works, with the following additional clauses:

12. In all places where the temperature in winter reaches 75° F. or 90° F. in summer, and in all places where the foregoing dusty processes are conducted, the committee recommends the employment of a fan, or other means of artificial ventilation.

13. All work, so far as possible, should be prohibited in rooms or stores where paper is dried, which should be separated from the machine or other work-rooms.

Dr. J. H. Van Deman	Chattanooga, Tenn.	1873
Joseph Emile Vanier, I. C.	107 St. James St., Montreal, P. Q.	1894
Dr. E. V. Van Norman	San Diego, Cal.	1882
Dr. P. W. Van Peyma	William and Koettner Sts., Buffalo, N. Y.	1896
Dr. E. E. Vaughan	Cambridge, Mass.	1887
Dr. Victor C. Vaughan	Ann Arbor, Mich.	1883
Dr. Harry E. Vaux, Member Provincial Board of Health	Brockville, Ont.	1894
Major Albert Veeder, M. D., Health Officer, 12 Queen St.	Lyons, N. Y.	1896
Dr. Andrew Truax Veeder	Rooms 310 and 311, Home Office Building, Pittsburgh, Pa.	1896
Mr. Joseph Venne	St. Jacques St., Montreal, P. Q.	1894
Dr. William A. Verge	47 Grande Allee, Quebec, P. Q.	1894
Hon. J. O. Villeneuve, Mayor of Montreal, and Member Legislative Assembly,	City Hall, N. W. St., Montreal, P. Q.	1894
Dr. W. W. Vinnedge	Lafayette, Ind.	1882
W. F. Von Beeskirk, C. E.	Stratford, Ont.	1896
Dr. Karl Von Ruck	Asheville, N. C.	1890
Dr. F. L. Von Suessmilch	Delevan, Wis.	1880
Dr. Spencer S. Wade	Morgantown, W. Va.	1892
Dr. B. R. Wakeman, Health Officer	73 Main St., Hornellsville, N. Y.	1896
Dr. Henry P. Walcott	Cambridge, Mass.	1880
Dr. Charles R. Walker	Concord, N. H.	1894
W. H. Walker	Washington and Corroll Sts., Buffalo, N. Y.	1896
Norval W. Wall, C. E., County Surveyor,	319 Main St., Trinidad, Col.	1895
Dr. Ralph Walsh	Washington, D. C.	1885
Dr. John Wanless	88 Union Ave., Montreal, P. Q.	1894
L. B. Ward, C. E.	Jersey City, N. J.	1885
Col. George E. Waring, C. E.	Newport, R. I.	1875
Dr. Irving A. Watson	Concord, N. H.	1881
Dr. J. Madison Watson	Elizabeth, N. J.	1882
Dr. William S. Watson	Fishkill-on-Hudson, N. Y.	1892
Dr. Alfred Tennyson Watt, Secretary Provincial Board of Health	Victoria, B. C.	1896
Dr. Warren Webster, U. S. A.	Wells River, Vt.	1873
Dr. Milton C. Wedgwood, Member State Board of Health	101 Pine St., Lewiston, Me.	1894
Hobart Weed	Buffalo, N. Y.	1896
Edson J. Weeks	Main and Erie Sts., Buffalo, N. Y.	1896
Henry P. Weidig, Ph. D., Chemist,	Clifford St., Newark, N. J.	1895
Dr. Carl Weidner, Professor of Histology and Pathology, Kentucky School of Medicine	1932 West Jefferson St., Louisville, Ky.	1895
Mr. Frank Wells, President State Board of Health,	Lansing, Mich.	1893
Dr. Ernest Wende	296 Water St., Buffalo, N. Y.	1894
Dr. H. P. Wenzel	Milwaukee, Wis.	1888